The FOUNDRY

Volume 56
Number 23

Published
Semimonthly

CLEVELAND, OHIO, DECEMBER 1, 1928

Castings Carry Metal from Furnace to Car

AN EXCELLENT example of the severe conditions which castings must overcome in service is found in the pig casting machines now employed in the majority of blast furnace plants. The modern machine, which has taken the place of the sand pig bed, consists essentially of an endless belt made up of a series of interlocking, cast-iron molds. When the casting machine is in operation, molten metal is taken from the blast furnace to the pouring station along the conveyor. The ladle containing the metal is placed in position in front of a spout leading to the conveyor. As each mold on the conveyor passes the ladle, it is filled with molten iron. Cooling of the metal is accelerated by spraying water on the molds and the metal just before the mold reaches the upper end of the conveyor section and the pig falls into a railway car. The mold is returned along the bottom of the conveyor and before it reaches the pouring station, it is sprayed or passes through a lime-water bath. Thus it may be seen that the mold is subject to continuous heating and cooling. In addition to the cast-iron molds, castings are used at other points in the construction of the machine. Manganese steel castings are employed where moving parts require materials that will resist wear. It is interesting to note that in 1927, according to the report of the Iron & Steel institute, 11,398,613 tons of pig iron was machine cast and 1,191,537 tons was sand cast. This contrasts with 1920 when approximately half of the pig iron produced was sand cast.

The Modern Pig Casting Machine Has Many Cast Parts

Find Where Castings Can Be Sold

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PUBLISHED BY THE PENTON PUBLISHING CO., CLEVELAND, O.
BRANCH OFFICES

CHICAGO ..... 1147 Peoples Gas Bldg.
CINCINNATI ..... 209 Edwards Bldg.
NEW YORK ..... 2203-2206 No. 220 Broadway
PITTSBURGH ..... 2148-49 Oliver Bldg.
SAN FRANCISCO ..... 24 California Street
WASHINGTON, D. C. ..... 1653 Pennsylvania Avenue
BIRMINGHAM, ENGLAND ..... Prince's Chambers
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PARIS, FRANCE ..... No. 9 Rue de Londres
BERLIN, GERMANY ..... Wilhelmstrasse 114, Berlin S. W. 48

Cable address, IROTRAPEN, London

SUBSCRIPTION

United States and Mexico ..... $3.00 a year
Canada ..... $4.00 a year
Great Britain and other Foreign Countries ..... £1:0:0 a year
Single copies ..... 25 cents

Copies published three months or more previous to date of current issue, 50 cents each

Member, Audit Bureau of Circulations, Associated Business Papers Inc., National Publishers' Association

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Accuracy Governs *Coremaking Processes* in Automobile Foundry

By Frank G. Steinebach

ANYONE passing through the plant of the Packard Motor Car Co., Detroit, cannot help but notice the large electrically illuminated sign stretching across the private roadway on which the main buildings of the plant are located. The proclamation "Quality First," carried on this sign, is not intended for the eye of the general public. It is displayed at a considerable distance and is fairly well hidden from Grand boulevard, the thoroughfare faced by the Packard office building. Rather, the sign was erected to make the motto the paramount idea in the minds of the large body of employes, since these two words express a policy upon which the company has been developed so successfully.

A study of the operations performed in the various departments of the Packard plant shows that quality is the first consideration in the production of the car which bears the company name. In the foundry where some of the most important parts are produced, methods of procedure have been studied and developed to such an extent that intricate castings are kept within

Fig. 1—A Delivery Car Carries the Sand from the Mixing Department to the Various Bins

Fig. 2 (Below)—Exhaust Castings Are Made on a Special Rig Consisting of a Rollover, Jolt Table and a Plain Jolt Table. Fig. 3 (Right)—Sand is mixed in Two Muller Type Machines Equipped with Power Loaders

exceptionally close tolerances. Materials entering the casting process are tested carefully. Metal from the cupola is analyzed several times daily as part of the close supervision exercised over the melting practice. Modern equipment is employed probably to the fullest possible extent.

Close limits required in the production of such castings as the engine block, head, etc., have resulted in a gradual change in molding methods. Little by little, cores have replaced certain parts of the mold, until at present the manufacture and assembly of cores used in the manufacture of various automobile parts constitutes one of the most interesting phases of foundry practice at the Packard plant. Every operation in the coreroom, from the reception of the core sand to delivery of the finished core has been studied carefully, with the result that the department functions in a highly efficient manner and exceptionally accurate cores are produced.

Core sand is delivered to the plant on a railroad sidetrack which parallels one side of the foundry building. The sand is dumped from the car on an apron conveyor located in the bottom of a pit built under the track. This conveyor carries the sand inside the building and dumps it into the boot of a bucket type elevator. The elevator carries the sand vertically 40 feet and dumps it on a long belt conveyor extending the full length of the sand storage building. A plow, mounted on a carriage which operates on steel rails located on either side of the belt, is used to divert the sand into any desired bin in the sand storage room. The storage department will accommodate 180 cars of sand; under ordinary conditions a sufficient amount to last through the winter season. The storage space may be divided into practically any desired number of bins, by building partitions along the roof supporting members.

Gates for discharging the sand from the various bins function in a tunnel located below the center of the sand storage building and extend-

ing the full length of the structure. A belt conveyor several feet below the discharge gate, operates the full length of the sand storage house and carries the discharged sand from the bin to a bucket elevator located at the same end of the building as the elevator which carries the sand to the building. A special rig has been developed to receive the sand and deposit it evenly moves in a horizontal direction. Pulling the gate toward the charging pan measures a pre-determined amount of sand which then falls into the mixer charging pan as the gate bottom drops. This is shown at the right in Fig. 3. The bottom of the gate comes to the horizontal position automatically as the gate is pushed back under the storage bin. The layout and sand extremely wet. The heavy water content prevents the sand mixture from sticking to the core boxes. The general run of cores is made from a mixture consisting of 480 quarts of sand, 50 per cent sharp sand and 50 per cent bank sand, 6 quarts of dry binder and 6 quarts of oil.

Sand and dry binder are measured into the loading chute, as shown in

Fig. 4—Many of the Cores Are Made on Molding Machines Located Along the Sand Bins

and gently on the belt conveyor. This unit consists of a short apron conveyor mounted on a carriage and propelled over rails located on each side of the conveyor. The apron conveyor unit may be moved up and down the conveyor line and placed under any discharge gate.

Sand is discharged from the belt conveyor into a boot and is carried by a bucket elevator to a point about 15 feet above the floor level where it falls on a belt conveyor and is carried to the bins located on each side of the two mixing machines, as shown in Fig. 3. Several plows divert the sand into the proper bins.

All core sand used at the Packard plant is mixed in two sand mixers, shown in Fig. 3. Each of the mixers is fed from two storage bins. One holds sharp sand and the other bank sand. Each storage bin is equipped with a batch measuring gate which handling equipment was designed by H. M. Lane, Detroit, and built and installed by the R. W. McIllvaine Co., Chicago. The two muller type sand mixers were built by the National Engineering Co., Chicago.

Due to the great variety of cores, several different mixtures must be used. Some batches are made up of both bank and sharp sand, while only sharp sand is used in other mixtures. A batch usually is in the neighborhood of 480 quarts of sand with sufficient binder and water added. Either a dry binder, linseed oil, or a combination of both are used. Cores to be used in the aluminum foundry are made of a mixture of 400 quarts of sand, 6 quarts of dry binder and 1½ quarts of linseed oil. The mixture for jacket cores consists of 300 quarts of sharp sand, 150 quarts of silica sand, 7 quarts of oil and a sufficient amount of water to make the mixture Fig. 3; the hoisting mechanism is engaged and the materials are dumped into the mixing pan. A vibrator attached to the bottom of the charging chute prevents sand from sticking when the pan is raised. A measuring device sprays the correct amount of oil over the mixture in the muller from a circular pipe extending around the top of the circular mixing pan. Water also is sprayed over the sand mixture from a similar pipe. Mixing time is governed by a small hour glass mounted on a post near the front of the machine, thus eliminating any guess work on the part of the sand mixing machine operator.

When properly mixed, the core sand is dumped into the boot of a bucket elevator and carried to the storage bins located above and between the two sand mixing units, as shown above the delivery car in Fig. 3. The operator in charge of the mixing machine

arranges the trough at the discharge end of the elevator to direct the sand into the proper bin. Eight bins accommodate the various mixtures required in the core department. A number system, also a color system, prevents any confusion in identifying a mixture. Bins are marked with tags numbered from 1 to 8. All tags marked with the numeral 1 are painted one color, those marked with a numeral 2, another color, and so on. This system also is used in the core making department so that the crane operator has no difficulty in distributing the sand mixtures to the various stations. When the core room foreman gives out a new job, he also sees that the proper sign is displayed at the side of the sand bin, as shown in Fig. 1, clearly indicating the sand mixture to be used.

Sand is delivered to the various core making stations in two bin cars which operate on a monorail track. One of the cars, built by the Detroit Hoist & Machine Co., Detroit, and shown in Fig. 1, has a motor drive at each end. The other car, made by the Chisholm-Moore Mfg. Co., Cleveland, has a motor drive at one end, as shown in Fig. 4. The cars carry bins at either end and the operator rides in the center. Combined capacity of the two bins is 1½ tons of mixed sand. Clearance between the bottom of the discharge gate and the top of the sand bins at the core making stations is slight, as may be noted in Figs. 2 and 4, so that practically no sand is spilled when the core sand mixture is discharged. Vibrator rapping devices on each car bin prevent the sand from sticking to the sides.

Considerable care has been exercised in the design and layout of the core department to provide straight line production. Backtracking of materials has been eliminated entirely. Everything moves in the direction of the gray iron foundry department at one end of the main building. Further changes now in process will decrease greatly the amount of material handling necessary and will increase the efficiency of the core department considerably. More new equipment is to be added. Layout of benches and machines is to be changed thus reducing the total amount of floor space required for the manufacture of cores. While this description deals with the existing core department, occasional reference will be made to the contemplated changes.

The core department occupies a space in the main foundry building between the aluminum foundry and the gray iron casting shop. Cores are made along four rows of bins and benches, similar to the row shown in Fig. 4. Each row of benches extends approximately three-quarters of the distance across the width of the building. The bin section at the end of the building adjacent to the aluminum foundry is devoted chiefly to bench work and is equipped with only two machines. One side of the next bin section is reserved for bench work and the opposite side of the same bin section is equipped with machines, as shown in Fig. 4. A large continuous core oven, to be described in detail later, recently has been built between the row of core machines just described and the next bin section to the east. One side of this next bin section is used for bench work, while the opposite side is equipped with a group of machines as shown in Fig. 1. The fourth and last bin section is used for both bench and machine work. The molding machines used at the plant were built by International Molding Machine Co., Chicago, Osborn Mfg. Co., Cleveland, E. J. Woodison Co., Detroit, and the Packard company.

Due to the variety of work, various pieces of equipment have been developed to increase production of certain types of cores. For example, a

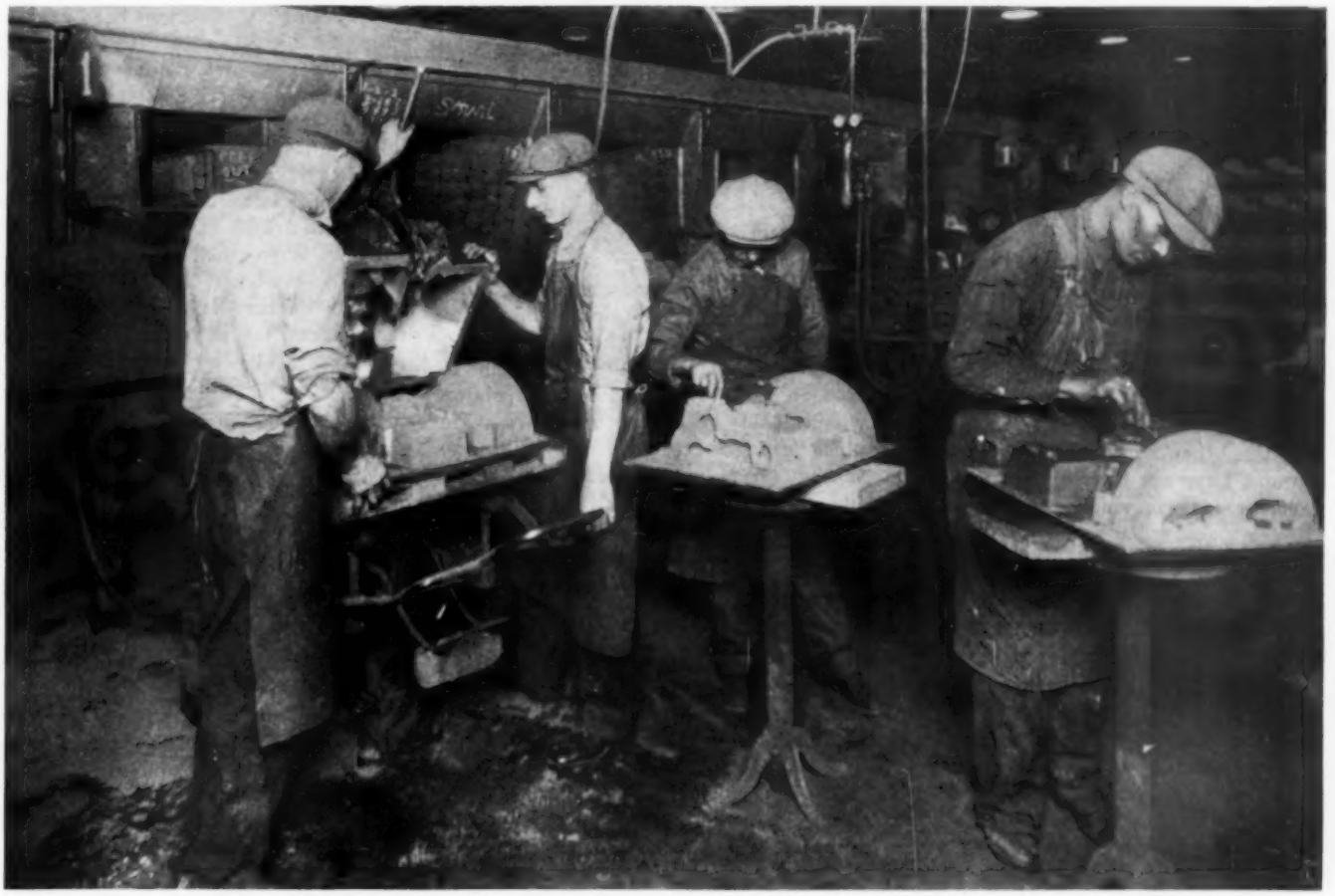


Fig. 5—The Flywheel Housing Core Is a Good Example of the Complicated Work Accomplished

multiple type core box is used to make small, simple cores, in quantities. The number in one corebox, which in reality is a plate, depends on the size of the core to be made, the highest number included on any one plate is 120. The machined core plate has four legs on the under side which rest on the machine platform. The multiple corebox is equipped with two screw clamps, which control a lug engaged in the machine platform. These screw clamps may be tightened easily and they hold the corebox securely to the machine. This simple clamping device enables the operator to take off one multiple corebox and put another in place in approximately 40 seconds. Sand in the multiple corebox is rammed by hand, the necessary wires are set in place, and the sand is struck off. A core plate then is clamped in place over the box and the table and corebox are rolled over. The vibrator is started and the plate and cores are dropped from the box by a hand operated lever. The multiple corebox and the other equipment, machine and clamps, have cut heavily into the labor cost for making small cores.

Mount Box on Machine

An interesting rig has been built to make cores for the engine exhaust port castings. The corebox and other equipment used on this machine was developed in the Packard shops. The machine, shown in Fig. 2, consists of a jolt cylinder and table and a roll-over, pattern draw table. One-half of the split corebox is mounted on a steel rod secured to the table, while the other half of the corebox is hinged to the rod. This rod is held at a predetermined height from the table by two supporting legs, one at each end of the corebox. The supporting leg is bolted securely to the platform of the roll-over table. The rod extends through the supporting legs to clamping devices, as may be noted in the illustration. The clamp consists of two *L* shaped pieces of cast iron mounted on the table. Each half has a semi-circular hole for the rod. The clamping device is operated by a small lever handle which actuates a screw and draws the two halves of the clamp together, thus holding the rod in any desired position.

The two halves of the corebox are locked together by a clamp, visible at the side of the corebox section resting on the table, Fig. 2. The entire corebox then is raised to the vertical position and locked with the clamping device previously described. The guide, shown above the machine in Fig. 2, is placed over the corebox. The jolt table is started and the core sand is dropped into the box. The guide box prevents the sand from falling around the box during the jolting operation. The rod clamps then are released and the box is dropped into the horizontal position in front of the main supporting rod. The exhaust casting core is angular in shape and one part extends through the corebox, as shown in Fig. 2.

After the corebox is placed in the horizontal position, the part of the core at a right angle with the long section, is rammed through the hole in the corebox, and a nail is set in place. The corebox then is turned through 180 degrees and the clamp is removed from the other part of the box by swinging it through 180 degrees. A dryer tray is placed over the portion of the box containing the cores and the tray and corebox are clamped to the platform by the clamp shown at the right in Fig. 2. The table then is rolled over and allowed to come to rest on the jolting table. The clamp which holds the box and dryer in place extends through the table so that it may be released from either the upper or the under side. The clamp is released, the roll-over table is raised, leaving the core in the dryer on the jolt table. A vibrator aids in drawing the corebox from the core.

Cores for engine heads are made on a roll-over, pattern draw machine, as shown in the foreground in Fig. 1. Half the core is made in the box on the machine and the other half is made in the box on the bench, shown at the extreme left in Fig. 1. This core is extremely light in section and contains a network of openings, so that it is necessary to use many wires to strengthen the sand. Approximately 46 different wires are used in the portion of the core made on the machine. Vent wires are inserted through four holes in the side of the box before the core is made and are removed after the core is completed. Two vent wires also pass through the corebox longitudinally.

The corebox used on the bench is provided with three hinges which fit into supports on the machine box. After the two parts of the core have been completed and one part has been sprinkled with a dry binder which acts as a paste, the hinges on the bench box are engaged in the supports on the machine box and the two parts of the core are brought together by swinging the two parts of the corebox in to a vertical position at the same time. The entire box then is lowered to the horizontal position with the machine box on the bottom. The top box is drawn from the core by swinging it on the hinges to the vertical position. The bench box is removed from the machine and dryers are placed in thirteen of the holes. A small amount of unbonded sand is placed at various points over the core to provide better support, and the dryer is clamped over the core. The box is rolled over, the clamp removed, and the dryer and core lowered from the box. A vibrator prevents sticking.

A special rig also has been built to make the barrel cores. The two parts of the corebox are mounted in a vertical position on the table of a plain jolt machine. This box is opened, closed and held firmly in the closed position by compressed air, controlled by a small hand operated valve. The box is filled with sand and jolted. The top part is rammed with a few blows from a mallet. The box then is opened, the core is placed on a dryer, and the process is repeated.

Cores Are Complicated

Manufacture of many cores in the automobile foundry is rather a complicated process. The flywheel housing core is a good example. A number of loose pieces and two pockets in the box require reinforcing. The core is made on a roll-over machine, similar to those shown in Figs. 4 and 5. The coremaker first wipes the inside of the box, then places three loose pieces and a shovel of sand. A projection at the bottom requires strengthening so a nail is added and another shovel of sand is placed in the box and rammed. Two loose pieces next are set followed by additional sand which is rammed and an arbor is adjusted in place. After another shovel of sand is placed in the box the pockets are rammed carefully and two nails and two rods are placed in the core to strengthen the pockets. Two heavy wire hooks are placed, extending from the top of the box into the core, and the box is filled with sand and rammed. The coremaker then digs out a small space around each of the wire hooks, so that they may be used in lowering the core into the mold and cuts two large vents in the core. The two loose pieces which form the covering for the pockets are removed. A dryer is clamped over the exposed sand and the assembly is rolled over. The clamp is released, the core dropped from the box, the box rolled over and the loose pieces taken from the core are replaced in the box. The coremaker then smoothes off the ridges caused by the loose pieces, blacks the core and places it on the oven conveyor.

This is the first of two articles describing the core department of the Packard Motor Car Co., Detroit. The concluding article will appear in an early issue.

SELLING PROBLEMS *Require Careful Analysis*

Attempts of Large Buyers To Dictate Prices They Will Pay for Commodity May Result in Producer Selling Below Manufacturing Cost

By W. D. Stowe

MARKETING problems of industrial plants of medium size and independent control are of a kind outside the horizon of the organization which has a monopoly or near monopoly in its field. Thousands of companies in business today do not and never will pre-empt their fields either by a tremendous fixed capital investment, exclusive public franchise, or through control of a limited natural resource. It is these manufacturers who should pursue a carefully studied course in their sales policies, and watch lest they be swamped in a morass of indiscriminate competition among themselves.

The meaning of careful study for the benefit of sales policies is seen clearly if a few specific cases are considered.

First, a study may be made of the big buyer with his big order and some of the aspects of the subject considered that ordinarily have little emphasis. Such a consideration will affect our attitude toward the big consumer and our business policies.

Should Not Cut Prices

Where the commodity sold constitutes a supply large in aggregate value, a big buyer will endeavor, probably with much success, to dictate the price he will pay for it and what margin of profit he will allow the supplying source. The buyer broadcasts his inquiries, and pits seller against seller. In times of depression, sharp price cutting is induced among sellers; and profits not only are reduced to the vanishing point, but orders are taken at loss under some such old excuse as *to keep the organization together.* Each manufacturer is out to save himself at the expense of fellow producers. Often that which he saves is an undernourished, dying industry.

When the commodity falls in the category of a large and important supply of a heavy buyer, the general rule for the seller is *from big business no more than lean profits.* This will prove true even where sellers cooperate intelligently in marketing, where each has an accurate knowledge in each of his costs, and will refuse to take business without at least a small margin of profit.

The underlying reason for this fact is discerned readily. If a big buyer, having large financial resources of his own, does not succeed in freezing out the largest part of the margin of profit by the fostering of competition among sellers, his next step is to set up his own manufacturing department to produce the goods which he has been buying. In so doing, he will eleminate *sales cost* from the total cost at which such goods are transferred from the producing department to the other departments which take them as supplies or raw material. Also a large part of what the independent entrepreneur considers as administration expense is eliminated from the total cost. To otherwise state it, the concern which was formerly the big buyer now transfers the goods between departments on the basis of direct costs plus manufacturing department burden only. It is the vertical trust effect. Examination will disclose it in many places where the general public does not think of it as existing. A common example is the large railroad company which establishes its own repair departments to produce foundry and machine shop products, electrical fittings, steam fittings, and locomotive parts.

While the commodity which is being supplied the big buyer constitutes a large value in the aggregate, the buyer's resources may be occupied to such an extent in other directions, as for instance in the period of a war, that he will, for the time being, purchase from vendors who are making considerable profits.

For his own preservation, the vendor must recognize this as an extraordinary situation. The state of affairs will terminate shortly. The fact must not be doubted, and financial and new business promotion policies must be shaped with that in view. By accumulating a reserve fund out of the unusual profit, the company may prepare to replace the present temporary business with new business. However, observation shows, that so devastating is the effect of suddenly withdrawing a large amount of business, to which the manufacturer for several years has devoted a large percentage of his production facilities, that companies which have attained an exceedingly strong financial position nevertheless are brought to the verge of ruin before they can find an adequate outlet to replace that which is lost. The ordinary outcome is intense depression, with refinancing, reorganization, or discontinuance of business.

Takes Profits and Quits

There is the type of alert business man who will seize upon a peculiar set of circumstances, convert them to the cash equivalent, take his profits and get out with them. He does not dissipate his gains by trying to maintain the organization which special circumstances once made profitable. Such a man with such a policy may profit through handling certain large requirements of the big consumer. Manufacturers, who wish to build a stable business, with an agreeable uniformity in profits over a period of years, are more likely to find their prosperity in the development of a broad sales field. They should maintain a position in which profitable operations will in no way depend upon requirements of a large and too powerful buyer.

Another class of problem is present in which the strength of the customer and the size of his orders are not the determining factors. Such commodities as wrapping paper, leather belting, or mechanics' tools and supplies, may be mentioned as examples of goods that are bought in such relatively small quantities that no ordinary consumer would consider the establishment of a department to pro-

duce his own small requirements. In such cases the manufacturer finds that his selling troubles arise out of the misshapen policies of marketing for which he and his fellow producers are responsible.

John Staple, of the John Staple Co., quotes the Mineral Pigment Co. $1.15 each for a certain steel container which the Pigment company buys in lots of 500 each. Staple loses the order. At a later date he finds that Errant & Co. secured the order at $1 per container. Years of experience and the careful analysis which Staple is able to make, convinces him that it costs Errant & Co. at the least $1.10 to place the containers in the possession of Mineral Pigment Co. More than one set of circumstances may produce such a situation as this.

In the first place, the efforts of some producers to arrive at their cost figures are so crude as to be little better than guesses. Also many making a systematic effort to determine costs often pursue inadequate and misleading methods of expense distribution. It may be that Errant & Co. in the example cited, are ignorant of a fact apparent to the competitor from his intelligent estimate, namely, that Errant & Co. have contracted at a selling price less than their cost of production.

Uses a Leader

On the other hand, Errant & Co. may be aware of the facts in the case, and may be using this particular size of container as a *leader*, after the fashion of the retail merchants. As a temporary artifice to draw business, such a price concession may have its place. To apply it as a steady practice to a staple article, has thoroughly unhealthy results in the trade. The buyer, aware of the price below production cost, is led to suspect that producers in this field are making extra compensating profit through the higher pricing of their other goods. If no compensating profit is made on other articles, the seller is taking one of the steps toward insufficient trade margin with its long train of industrial decline.

It may please a manufacturer to carry such a *leader* without regard to its effect on the business of fellow producers. However, the point of view of the intelligent executive is changed when competitors develop "leaders" of their own, in goods in which the first manufacturer has thought he could recoup himself by normal or extra profit margins.

An executive may believe that a considerable proportion of his sales may be made continuously at a price sufficiently below cost to be especially attractive to the buyer. It is doubtful if a manufacturer, who considers such expense a substitute for other forms of advertising, has any true idea of the ratio which advertising cost should bear to total price. In other words, a price cut large enough to be in itself an attraction to the buyer, sacrifices something much more than that portion of price which a producer normally allots to cover the element of advertising cost in the total of business expenses.

Price Cuts Ruin Business

Emergency price cuts to get business have been mentioned. For example, there is the unwarranted sacrifice of profit margins to advance the placing of an order which could be taken later at normal figures; or to divert from its natural course, at the urging of pure greed, an order which would flow naturally to a fellow producer at normal price and profit margin. No widened field of usefulness is opened by such a price cut, and no lowering of producing costs takes place, because there is no real expansion in volume of production. The ordinary outcome is retaliatory price cutting by the competitor who is deprived of his normal business, and a system is introduced whereby the whole industry is impoverished by the short-sighted tactics so introduced. Indiscriminate efforts are made to recover a market even on terms at which it is no longer profitable.

A policy which produces a pendulum effect in the market is over selling. Overstocking of the middle men, or gorging of the consumers, or both, may occur. Advertising and sales effort may be so intense as to cause a heavy upswing in the gross sales pendulum, buyers being filled with a highly artificial enthusiasm for the goods. The market is stuffed and consumers satiated with their purchases before they wake to the real situation.

Selling beyond the bounds of usefulness to the consumer is altogether uneconomic. Except as relates to what admittedly are mere novelties, the cultivation of wild enthusiasm in any market is out of place. In the case of novelties, the experienced middle man is on his guard; and the manufacturer is well aware that his future lies in a realm of adroit changes gaged to meet a fickle demand.

Yet manufacturers of staple goods sometimes will proceed as though some net benefit might accrue from forcing the market. A maker of trolley wheels, or of men's shoes, or of pipe wrenches, in a period of dull business, cuts his price to load his customers' storerooms with abnormal inventories. Having kept his factory running by such means in a period that naturally would call for a shut down, the producer still appears to think the coming months will yield him a normal business in the same commodity at regular prices. Time confronts him with the disappointing fact that he cannot sell where their is already an over-abundance. He throws more money into selling effort, attempts to open new markets, and in spite of everything tries to force more goods upon the old market. His net income shows the inevitable rebound of the pendulum.

Should Change Line

The cutting of price out of all relation to the cost of placing the goods in the buyers' hands, merely to secure a temporary outlet, is a gesture of despair. It is one of the blind outlashings of a harrassed producer unless there has been permanent falling off in market value, as through such causes as articles become obsolete. One of two conditions may be recognized. If there is place for the industry in the economic scheme, and a place for this producer in the industry, the manufacturer should bide his time and, in co-operation with other producers, take his share of business on a profitable basis. If economic progress has caused the industry to reach a point where its activities should be curtailed permanently, and this producer should throw his resources into some other line of activity, the fact should be faced squarely.

It is more economic to take a quick loss with trenchant reorganization, than to endure a long period of decadence. In one case there is strength to sacrifice the old established resources to enter a new field of healthy demand. In the other case, years of decrepitude leave the weakened hulk of an industry, a discouraged personnel, and in the district where the plant is located a community long suffering under lowered standards of life.

When the bicycle industry collapsed at about the year 1900, many of the producers recognized promptly the inescapable facts, and turned resolutely to other fields of endeavor. A few found nourishment in a residual market that would have furnished but sorry sustenance had all the producers striven to divide it among them.

Selling is a branch of industry—or to analyze it still more closely—a branch of the marketing function,

which readily can and often does degenerate into wasteful strife. A factor which contributes to this result is the attitude of conservative investors, who lend money rather than invest it as owners of enterprises.

The capitalist who lends on note or mortgage bond, is prone to judge the future of his security chiefly on the basis of its past. In 1901, a wagon making plant with a history of 10 per cent average earnings for 25 years, would command money for its bonds or preferred stock much more quickly than would a plant setting forth a hopeful prospect of profit through the making of automobiles. In 1927, an automobile plant with a history of such 10 per cent average earnings, even should there be a shadow on its present outlook, will command much more attention of investors than would the hopeful vision of a man seeking a loan to build airplanes. An industry because it can point to a past, will command capital far more readily than an industry which can point only to a future.

Introduces Machine Equipment

Thus there is growth toward over equipment and over capitalization of established industries. The earnings of such industries consequently tend to diminish through over competition and overlapping efforts in sales fields and other directions. The other phase of the situation is that in old industries, increased capital investment constantly eliminates labor by the introduction of more and more machine equipment, and this displaced labor must find new occupation in new industry.

However, capital invested in new industries expands the requirement for labor; and it is necessary that such a capital flow into new fields be maintained to prevent waste and demoralization from the release of labor due to the growing investments in old fields. This is in harmony with the statement that common stock investments, with their speculative element, ought proportionately to keep pace with loans and guaranteed, (preferred stock) investments.

There is need for fostering those conditions under which business energy and capital will take cognizance of widespread human needs that are now insufficiently ministered to. Education and culture constantly are developing important new demands. The discernment of those demands and their translation into commercial projects involves the element of speculation. Economic progress calls for conditions in which returns on successful speculations shall be sufficient to compensate, on the average, for losses on the unsuccessful. Taxes, for example, should not take so much of large speculative gains as to discourage entrepreneurs from new undertakings, which in the nature of things show a large proportionate number of failure and loss.

For clarifying their problems, fostering a healthful trade atmosphere, and protecting industry from outside hostile forces, manufacturers in many lines have found a vigorous trade association to be an effective instrumentality. For substantial benefits to accrue from association, full faith must obtain between members with reference to those matters in which they have decided to pool their strength and act as a unit. Good organization and whole-hearted support in these associations make possible far reaching co-operative measures. Among them are the compilation and dissemination of information on such subjects as available inventories, past sales prices, distribution costs in various markets, fixed investments, and credit data; the adoption of uniform methods of cost accounting that permit of comparisons fruitful toward efficient operation; concerted action for the protection of legal rights, and for the advancement of commercial interests common to all the members.

Large business institutions command specialized services of their own which contribute greatly toward a far-sighted course of action. The smaller institutions also should make use of the channels which are open to them for clarifying their outlook and drawing upon expert counsel.

It is to be borne in mind that when manufacturers pursue policies which retain for them a place in the industrial march of progress, the benefit accrues to whole communities of which such plants are important factors.

Includes Eight Steel Castings Firms

In an article appearing on page 880 of THE FOUNDRY for Nov. 1, the Steel Castings Development Bureau is given as including the following: Atlantic Steel Castings Co., Chester, Pa.; Pennsylvania Electric Steel Casting Co., Hamburg, Pa.; Empire Steel Casting Co., Reading, Pa.; Dodge Steel Casting Co., Philadelphia; Deemer Steel Casting Co., New Castle, Pa.; Crucible Steel Castings Co., Lansdowne, Pa.

In addition the Riverside Steel Casting Co., Newark, N. J., and the Treadwell Engineering Co., Easton, Pa., are members of the group.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of THE FOUNDRY or of its editors.

TO THE EDITORS:

A short article by W. C. Lang in the April 15 issue of THE FOUNDRY seems to call for some comment. He claims to have developed a slide corebox about 15 years ago for the rapid production of small stopoff cores with tail prints.

I made a similar box 20 years ago while serving my apprenticeship as a patternmaker. My boss sent me to the coreroom to get a box that would serve as a model. It was similar in every respect to the box described and illustrated by Mr. Lang. The foreman told me he had used that type of box for years and that he did not originate it.

Later as I drifted around the country I found the same type of corebox in several foundries. In my opinion it is just one of the intimate tricks of the trade familiar to many men, but one to which no person can point with certainty or claim to be the originator. Undoubtedly some person at some time, long before the days of the present writer, or those of Mr. Lang, tried the device for the first time and it is in justice to his memory that this comment is made.

ANDREW C. HOAK,
Niagara Falls, N. Y.

Uses Permanent Molds

TO THE EDITOR:

I have noticed in THE FOUNDRY issue of Sept. 15 an article "Methods Used in Molding Cast Iron Balls." I have had a considerable experience in making grinding balls in various sizes from ⅞ to 4½ inches both in sand and permanent molds.

This tonnage of 60,000 pounds per month of 1¼-inch, cast-iron grinding balls or as you put it, 2300 pounds per day, would be an easy matter to turn out in permanent molds. In fact, when properly installed and arranged they will eliminate 85 per cent of the labor and greatly decrease your loss.

The permanent molding machine used in this country is a practical and efficient equipment for manufacturing grinding balls. There is no better evidence of this than the fact that this molding machine is engaged in making grinding balls and turning out a daily tonnage of more than 80 tons in various foundries.

DANIEL MCDONALD,
Oakland, Calif.

How Equipment Cuts Foundry Operating Costs

By John Allen Murphy

FOUNDRY efficiency depends to a considerable extent on overhead material handling apparatus. Many foundries otherwise up-to-date unload coke, pig iron and scrap and charge the cupola according to old fashioned standards and as a result they add unnecessarily to their labor costs and slow down their production. Adoption of overhead equipment developed in recent years has cut down material handling costs to an appreciable extent in many foundries.

The proper type of overhead handling equipment for unloading and charging materials in a gray iron foundry depends on a number of factors including: Tonnage, size of cupolas, location of materials in the yard, size and shape of the yard, location of cupolas in relation to the railroad siding and hauling facilities.

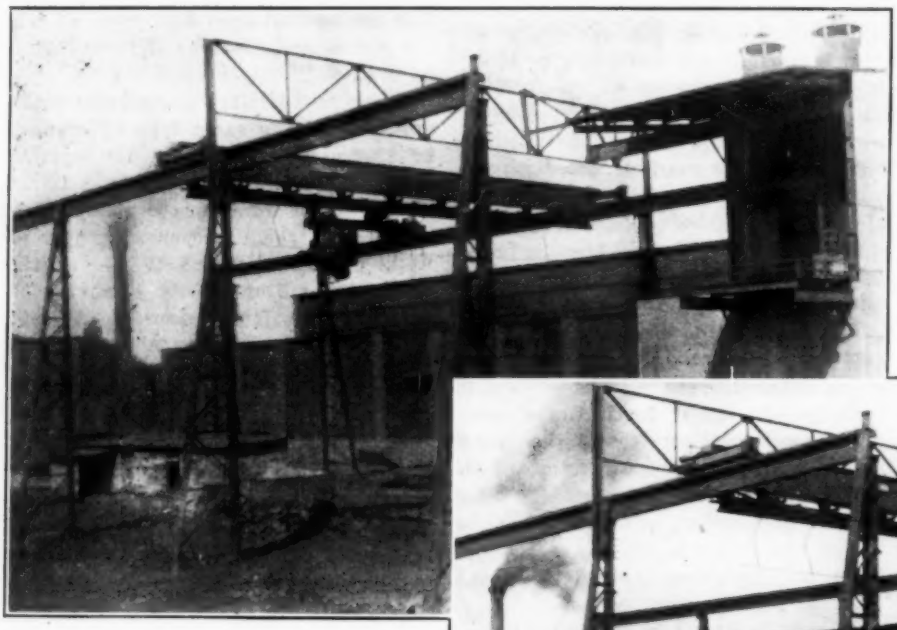
The amount of metal melted daily determines the size, type and number of units to be installed, but practically every foundry profitably can employ some form of charging hoist. In the small foundry this may take the form of a single motor hoist, floor controlled and operated along an I-beam by a rigid staff attached to the frame of the hoist.

Accurate weight and distribution of the charges is required in many instances to meet exacting requirements in the resulting product. In one piston ring foundry where the daily heat ranges between 3 and 5 tons, the foregoing type of installation is giving satisfaction. The small foundry is under no more obligation than the large foundry to operate under a set of uneconomical conditions.

Where the daily heat is over 5 tons and less than 20 tons the usual custom is to employ a floor operated cupola charging hoist with two motors. One motor controls the hoisting and the second operates the trolley.

A combination of charging hoist and transfer bridge has been installed in many foundries where the weight of metal melted daily amounts to between 20 and 150 tons. One type of combination crane and charging hoist may be run across a transfer bridge and employed either in general yard work or in charging the cupola. However, this arrangement depends on the relative position of the cupola and the railroad siding. Obviously a transfer crane cannot be employed to advantage where the distance between is too great. In laying out the site for a new foundry, the cupola, if at all possible, is located close to the railroad siding. This arrangement is economical since cupola charging and miscellaneous yard handling come under one crane and one operator.

Where the cupola charging hoist is kept busy all day, the yard work might be done at night by a second operator. Where, for any reason,



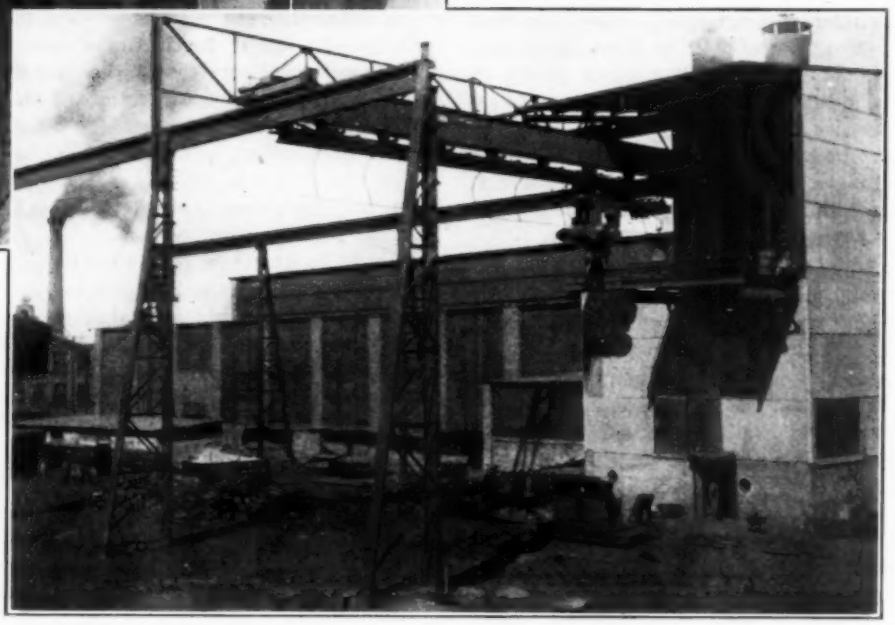


Fig. 1 (Above)—Hoist Conveys Loaded Bucket from Scale Car to Charging Door. Fig. 2 (Right)—The Same Crane May Be Equipped with a Magnet or Bucket

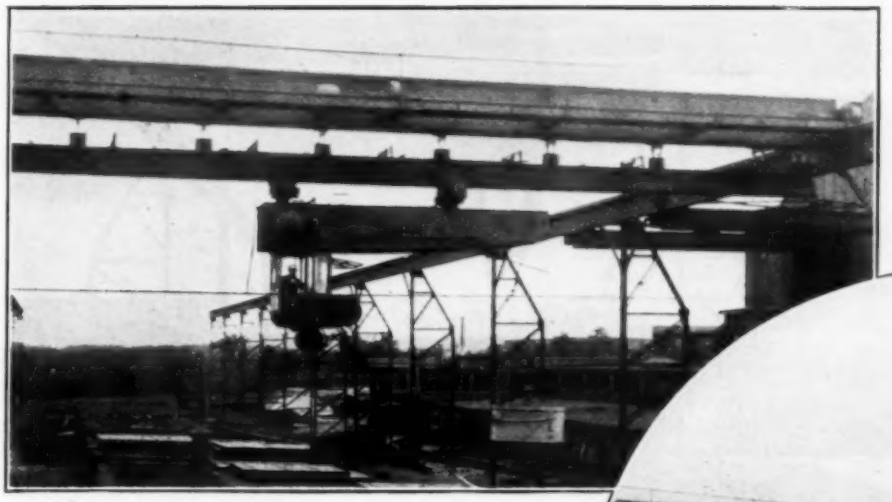


Fig. 3 (Left)—The Transfer Hoist May Be Shifted to Any One of Several Tracks. Fig. 4 (Below)—The Hoist May Be Detached from the Bridge and Reversed

night work is not feasible, the transfer crane offers no advantage over the ordinary type.

Fortunately, in the great majority of foundries, the charging hoist is not employed all day. The melting period only covers from 1 to 3 hours in the afternoon. The remainder of the time is ample for attending to the routine and special yard work.

A combination transfer crane recently installed to serve the cupolas and yard of a foundry with a daily melting capacity of 25 tons is shown in Figs. 1 and 2. In Fig. 2 the magnet is shown suspended from the hook of the cupola charging hoist and used for unloading materials and placing them outside an industrial track carrying a push type scale car. This hoist also may be attached to a grab bucket for unloading sand, coke and limestone. In Fig. 1 the hoist is shown just about to place a loaded drop bottom bucket in the cupola. The bucket has been lifted from the scale car on the track below the hoist. Material is charged directly into either of the two cupolas from the end of the transfer bridge. Light construction of the cupola building and great height of the cupolas, lined to 37 inches, are items to attract attention. The cost of entire steel work for this building amounted to $3500.

This figure is in decided contrast to the cost of constructing the former type of heavy, reinforced charging floor capable in many instances of supporting hundreds of tons of coke, pig iron, scrap and other materials. At present prevailing prices the cost of one of these old time floors would approach $50,000. Interest on a charging floor investment of that amount soon would pay for a complete installation of modern handling equipment. How an old foundry yard was redesigned and served by one piece of equipment is shown in Figs. 3 and 4. This foundry has a maximum daily melting capacity of 150 tons.

A cupola charging hoist lifting a bucket from a traveling scale car is shown in Fig. 5. This illustration also shows the transfer bridge latched to one of the two spur tracks leading to the cupolas.

The hoist headed in the opposite direction after a turn on the turntable located in front of the cupola is shown in Fig. 4. In this position the hoist may be employed to handle a variety of material in the yard. The snout of the hoist projects 2 feet 7 inches beyond the line of the runway columns. A 68-foot span transfer crane has an actual coverage of 73 feet in width, or approximately the same sweep as a standard type 80-foot span crane. A safety device prevents operation of the transfer bridge unless the hoist is back a sufficient distance for the snout to clear the columns. Supporting columns on this runway are spaced on 40-foot centers.

The illustration in Fig. 6 shows how the same crane, equipped with a 55-inch magnet, unloads a 55-ton carload of pig iron in 40 minutes. With a 1½-yard bucket the crane shown in Fig. 7 unloads a carload of sand in 1 hour. The method of handling coke with a motor-operated bucket is shown in Fig. 8. In this particular plant the charging hoist is employed on the cupolas all day and carries on unloading operations at night under flood lights which illuminate the yard.

The inside diameter of the cupola lining determines the size of the bucket to be used. The total for each charge including coke, pig iron, scrap and limestone determines the capacity of the hoist to be employed. The height of the charging door opening depends on the distance from the top of the hoist structural frame to the bottom of the open bucket. These factors in turn decide the location of the I-beam runway for the charging hoist.

Modern tendency in cupola construction favors a considerable increase over that formerly regarded as standard in the distance between the charging door sill and the bottom doors. With hand charging this distance rarely exceeded 13 to 15 feet. In recent installations, either new or revamped cupolas, the distance has been increased to between 20 and 25 feet. In a foundry recently placed in operation the distance between

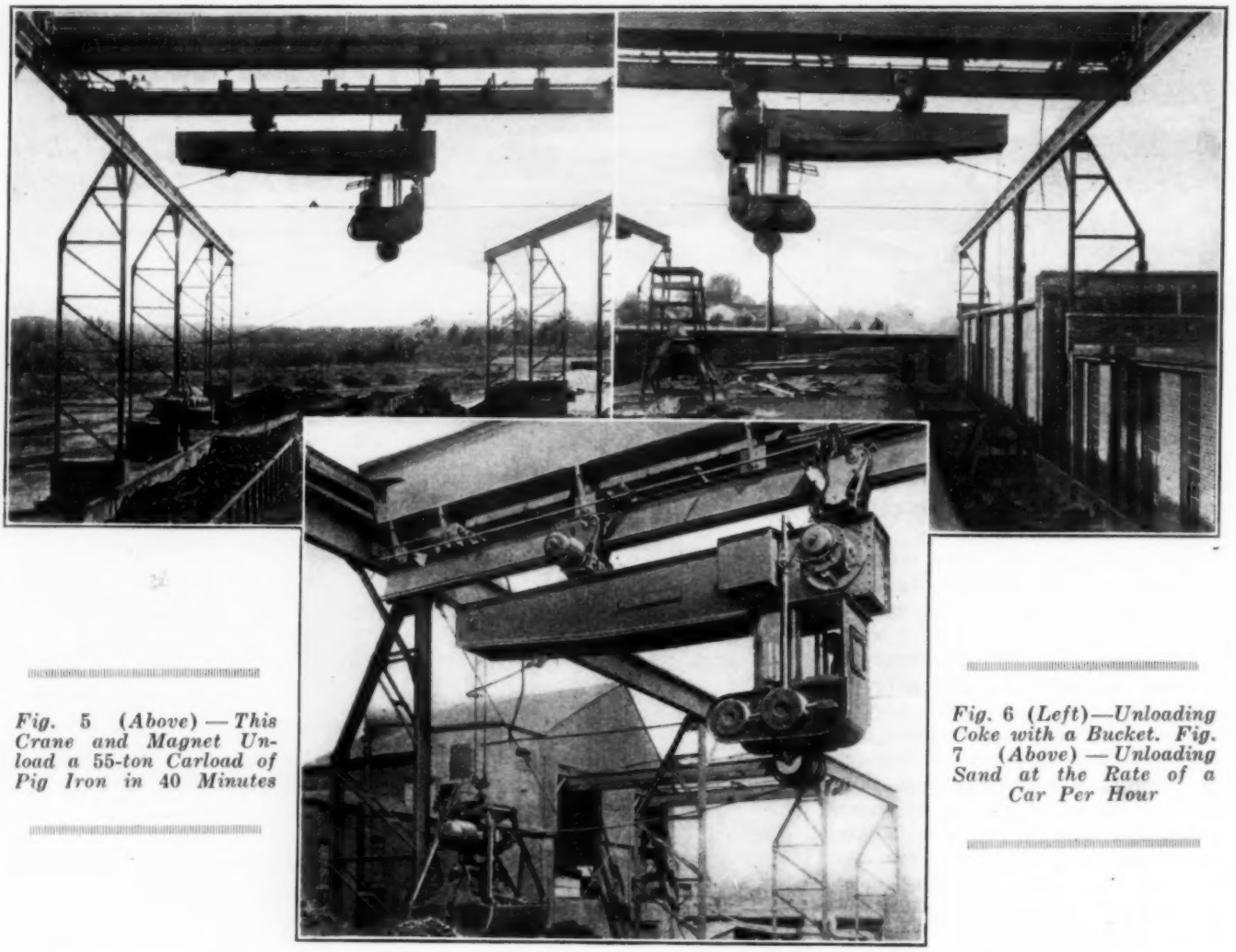


Fig. 5 (Above) — This Crane and Magnet Unload a 55-ton Carload of Pig Iron in 40 Minutes

Fig. 6 (Left)—Unloading Coke with a Bucket. Fig. 7 (Above) — Unloading Sand at the Rate of a Car Per Hour

the bottom doors and the charging sills of the two cupolas is 32 feet 6 inches. In an old foundry recently remodeled the depth of the cupola was increased from 13 to 22 feet, thereby effecting a coke saving for the year of $1500 on a daily heat ranging between 50 and 80 tons. It is claimed that hotter and more satisfactory metal has been secured under the new operating conditions.

In a deep cupola the charge is preheated before it reaches the melting zone, thus securing hotter metal with less coke. Excessive *pounding* under former methods where all the materials for the charge were dropped from the level of the charging door, discouraged construction and erection of high cupolas.

Under present conditions all the materials may be lowered gently to the bottom. Sand for the bottom may be lowered in a bucket and dumped. The cupola tender steps on the hook and is lowered to the bottom. After he has prepared the sand bottom, he is lifted out by the same device. Wood and coke for the bed may be lowered in the same manner. Later the first charges of iron and coke are lowered to place. After the cupola has been filled to the charging door the remainder of the charge is placed at that level.

Weld Broken Crankshaft in Record Time

By Robert E. Masters

When the government engineering department decides to have some work done on the outside, at least three bids are asked. Occasionally a breakdown occurs which cannot wait for the formality of sending out for and receiving bids. Then it becomes an *emergency* job and it is taken to the nearest convenient plant where the officer in charge assumes he will get prompt and reliable service.

Back in 1908 while I was manager of a plant in Houston, Tex., the captain of the government dredge COLONEL A. M. MILLER brought in one of these emergency jobs, a broken crankshaft which we claimed to be able to repair by the thermit welding process. It was rather a remarkable job for the time and place since the process was comparatively new and little known. The foundry foreman at the time, George Brown, had had considerable experience with the process and had become quite expert, but naturally every new job was more or less of an experiment and an element of doubt existed until the job was finished. The dredge must remain idle until repairs were completed.

Captain Amburn remained in the shop an interested spectator during the entire process of lining up the shaft, preparing the mold and pouring the thermit. He also remained until midnight and saw the shaft machined and shipped to the dredge at Galveston, where dredging operations were resumed in the morning. Only part of one day was lost over the breakdown. Later we had a letter from Captain Amburn: "I must express my appreciation and gratification on the quality of the work done on the crankshaft. It is a perfect piece of work and gives complete satisfaction."

Despatch Oven Co., 116-122 First avenue north, Minneapolis, plans the erection of a new factory for the manufacture of ovens.

Electric Furnace Is Advantageous *UNDER SPECIAL CONDITIONS*

ALTHOUGH the cupola is the cheapest melting device for the production of molten iron under normal market conditions for pig iron, coke and clean cast-iron scrap, conditions exist under which the expense of melting is not the major factor. Other advantages possessed by the electric furnace sometimes make it more desirable according to the bureau of mines. Recently a comprehensive investigation of making electric-furnace cast iron was completed by the bureau at its Northwest experiment station, Seattle, in co-operation with the college of mines, University of Washington. The investigation involved a year's successful operation of a jobbing foundry making miscellaneous gray-iron castings from steel scrap.

Under the special conditions that make the electric furnace advantageous, this type of furnace necessarily need not displace the cupola but may be used in conjunction with it. The ability of the electric furnace to refine and superheat the iron, and the claimed superiority of electric furnace iron to cupola iron, make the electric furnace advantageous under special conditions. In addition, the possibility of producing electric furnace cast iron from cheap grades of ferrous scrap has brought the electric furnace into prominence.

Use High Sulphur Scrap

Electric furnace cast iron is claimed to be stronger, tougher and more dense than cupola iron, and a higher recovery of metal in casting may be obtained due to the higher pouring temperature according to C. E. Williams and C. E. Sims, authors of technical paper No. 418, "Electric Furnace Cast Iron," just issued by the bureau of mines. Cast iron scrap with high sulphur content may be converted into high-grade cast iron, low in sulphur, either by melting directly in the electric furnace or by refining molten metal from the cupola. Large additions of steel scrap may be used if desirable, or steel scrap can be used entirely and synthetic cast iron made. Some of the advantages of the production of synthetic cast iron follow:

One electric furnace may be used to produce both iron and steel and thereby may be kept in operation during periods when it otherwise might be idle. By operating an electric furnace continuously labor is kept employed usefully, the heat of the furnace is conserved, life of the refractories is extended, overhead charges are reduced, and a high load factor on the power lines is maintained. Therefore, even under conditions where production of synthetic iron of itself would not be economical, it might be profitable in conjunction with the making of steel, because of the possibility of reducing the cost of producing steel.

Produce Synthetic Iron

A large variety of steel and iron scrap may be used to make the same product, and many different products can be made from the same materials. As a rule, scrap is purchased locally, and the foundryman can buy and use what is at hand without shopping around for special materials. The production of synthetic iron in a steel foundry simplifies the purchase of steel melting scrap. For example, the making of acid steel requires selected scrap for which a higher price must be paid than for general scrap; but if, in addition to steel, synthetic iron is made, miscellaneous steel scrap may be purchased at a minimum price and the foundryman can do his own sorting, using the best scrap for acid steel.

Synthetic iron may be tested and adjusted for composition and temperature before it is poured, thus assuring castings of the desired composition. Moreover, if the pouring crew is not ready, the metal may be kept hot as long as necessary, whereas metal must be taken from the cupola when enough has been melted to pour.

In the electric furnace an iron can be made with transverse strengths of 5000 to 6000 pounds on standard bars of synthetic gray iron. Tensile strengths above 40,000 pounds per square inch are common. One of the outstanding characteristics of electric furnace gray iron is its resistance to impact of shock. These advantages in strength and toughness are due largely to the physical structure of the iron, which is fine grained and dense. The graphite exists in such small flakes that a piece of synthetic iron of the same graphitic carbon content as a piece of cupola iron will appear to contain less graphite. Although it looks whiter and harder than cupola iron, synthetic iron is soft and easily machined. A coarse-grained synthetic iron can be obtained only when the carbon and the silicon contents are exceptionally high. Ordinary synthetic iron is at least equivalent in strength to the high-test irons and semi-steels of the cupola.

Virtually any kind of ferrous scrap can be used in the electric furnace, thus providing a means for industrial plants to utilize the scrap they produce instead of shipping it away at an economic loss. Besides steel scrap, which may be carburized to gray iron, gray iron borings and light scrap may be used profitably.

The production of synthetic cast iron in the electric furnace is advantageous in such places as large nonferrous smelters and mills, where pig iron is expensive and ferrous scrap is usually available. Many ore concentration plants consume a large tonnage of steel and iron balls and ball-mill liners for fine grinding, and satisfactory white cast iron for these purposes could be made economically at the plant.

A tough and hard white iron, such as may be produced in the electric furnace from steel scrap, will find useful application where resistance to shock and abrasion are required.

Describes Cast Pipe Manufacture

John D. Capron, research manager, U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J., spoke at the meeting of Philadelphia Foundrymen's association at the Manufacturers club, Philadelphia, Nov. 14, on making cast iron water and gas pipe. Mr. Capron also presented moving pictures showing the dry sand mold method and some illustrations of the De Lavaud centrifugal process.

Snyder Supply Co., has changed its address from Huntington Park, Calif., to 2435 East Fifty-eighth street, Los Angeles.

Co-operation Between Operating and Sales Departments *Is Essential for Success*

By K. V. Wheeler

THE subject of this paper is not one in which the discussion may lead to conclusive proofs. A dozen writers could approach the topic in several different ways, using as many examples to illustrate the various points. Before launching into a discussion of the subject, some definitions will be submitted so that all will start from the same premise.

Interdependence, according to Webster, is a "mutual dependence", in this case implying that the operating and sales departments of the steel foundry, drawing on each other for advice and help in their respective duties, each has distinct bearing on the success of their joint effort.

Operating department is that part of the organization which is responsible for the manufacture of the product, including purchasing, production, development, and research into methods.

The sales department is that part of the organization which fixes the selling price of the product; comes in direct contact with customers; is responsible for satisfactory service respecting deliveries, and insures a quality essential for the service required.

A third department in each organization, is quite essential to success. This is the statistical department, or a department designated by some other name, which is responsible for the accummulation and tabulation of data so essential to a correct understanding of the business as a whole, and of the individual jobs, the sum of which comprises the product.

It has been the author's observation that success in the steel foundry is subject to various interpretations. We have known foundrymen who felt that success was measured by total sales value, by volume expressed in tonnage, or by percentage of shop capacity utilized. Other foundrymen have considered success to result only from the development of methods enabling them to produce castings of a quality superior to those made by their competitors. In fact, one foundry manager is recalled whose greatest ambition was to tackle those jobs which were giving trouble in other foundries. It was a source of keen enjoyment to him to produce such castings satisfactory, often forgetting the cost of production and the commercial value of castings produced.

Other foundrymen measure success by the degree of prestige or reputation they earn and enjoy in the industry, as pioneers in the development of its technique. Again there are certain foundrymen whose idea of successful business is to regularly secure work from their competitors without any regard for accepted business ethics, and whose keenest delight is the consummation of business deals which the orthodox business man might charitably term shrewd.

Our conception of success as applied to the steel foundry is a combination of net profits earned and the permanent growth or expansion of the company. The primary purpose of business is profit. Permanent profits are possible only if the conduct of the business is based on sound business policies, the prime requisities of which are satisfied customers, contented employes, and a reasonable margin between the cost and selling price of the product.

With these definitions, clarifying the meaning of the subject, the discussion may be started from a basis which prevents any misconception of terms used. Let us now consider why, in a steel foundry, it is so essential that the operating and sales departments should always work together closely. While the making of steel castings presents many problems quite similar to those confronting the manufacture of other products, it has certain inherent peculiarities, due to the material with which we work and the nature of the market problem. To illustrate this difference, let us compare it with the manufacture of the automobile.

Design of the car is based on intensive study of service conditions. It is then built and thoroughly tested. If the results are satisfactory from the standpoint of performance, probable cost, and marketability, the attention of the operating department is then directed to the problem of volume production and cost reduction, the sales department to the intensive selling in universal markets, and the engineering department to new improvements. The operating department, through repetitive production, can study the minutest details of every phase of operating, and the results of improvements are manifested in the cost, not on one car nor on one particular style of car, but on all the cars that may be manufactured.

The sales department's field is practically limitless, embracing the entire world, or we might say, that part of the population which can afford the luxury of a car, even to the extent of mortgaging earnings for years ahead.

Although through research and plant engineering we develop improved methods and reduced costs in the general production of steel castings, we do not, through engineering, research, and test, develop a steel casting or many steel castings of special design, and then pass them over to the sales department to sell. Steel castings are bought only after they have been specified by the engineers of other industries. Consequently the sales department is the beginning and the operating department the end, reversing the procedure of the automotive industry.

Because of the peculiar characteristics of molten metal poured into sand molds, each new casting presents an engineering problem in itself. This is true regardless of the kind of metal employed. It is true in steel castings to a greater extent than it is with castings made from metals other than steel.

The greatest problem of the steel foundry is that of shrinkage and temperature. Cast steel, when cooling

Is General Manager

THIS article is abstracted from a paper presented at a session on steel founding which was held at the Philadelphia convention of the American Foundrymen's association. The author is general manager of the Lebanon Steel foundry, Lebanon, Pa.

from molten to room temperatures, contracts within itself in both the liquid and solid state. Patterns are made oversize that the castings may have proper dimensions. To take care of the contraction or shrinkage before and during solidification, provision must be made to compensate for the contraction of the metal in the casting. If the latter is of such design that this can not be accomplished by natural methods, such as the use of sink heads or risers directly over the member to be fed, artificial methods, such as the use of chills, must be employed to counteract this shrinkage, and synchronize so far as possible, the cooling rates of the heavier and lighter sections. Excessive restriction will produce casting weaknesses, consequently the metal must be poured into molds which will not resist the pressure of the contracting steel.

Each individual casting which varies from another casting, even to a small degree in one or more of its members, presents a distinct problem to satisfactorily counteract these shrinkage peculiarities of the metal, which must be solved by the careful study of the design and the thoughtful consideration of the metal's characteristics. There are certain fundamental principles in steel founding which are applicable to the making of all castings, but judgment, based on past experience with castings of similar shape and size, is equally essential to solution of the problem.

Must Be Refractory

High temperature at which steel for castings is poured makes it difficult to obtain commercial materials of suitable refractoriness and stability to withstand fusion and erosion in the mold, and which do not cause undesirable chemical reactions in the metal of the casting. The size and design of castings materially affect these phenomena and must be carefully considered for each job.

The point we want to stress is that the making of any casting in steel is not solely a producing problem, but a combination of producing and engineering efforts, which vary with the type, size, and design. The stage of production is reached only after the sales department has acquired orders from those who have need of the castings. As the automotive engineers have divergent views regarding materials, design, and construction, just so have steel foundry engineers developed different methods of satisfactorily making castings of the same design. In either case, it is a wise or impulsive man who declares that one is right and all others are wrong.

This brings us to the subject of correct pattern equipment, which is so essential to quality and cost in the making of steel castings. Pattern requirements will vary in different foundries, but that most suited to the foundry producing the castings should be supplied. How are we going to get the proper kind of pattern equipment excepting through the close co-operation of the operating and sales departments? The sales department knows what constitutes satisfactory pattern equipment for any particular job, only through information given it by its operating conferes. Obviously the operating department must secure the proper kind of pattern equipment through the sales department's contact with the customer. Here co-operation is indispensable.

Design of Castings

Let us now consider the question of design, which plays a most important part in securing castings which are sound in all members. Unfortunately the designing engineers in most industries using steel castings are unfamiliar with founding, particularly steel founding. Although we know that, primarily their aims are to design a product to meet required service conditions and lowest total manufacturing cost, it sometimes seems that some designers obtain their greatest enjoyment in conceiving veritable mazes of interesting ribs and complicated bosses, which, from a foundry viewpoint, not only are impractical but in many cases inpossible to satisfactorily produce in one sound integral piece of steel. However, it has been the author's observation, as of many other foundrymen with whom he has come in contact, that the capable engineer not only tolerates but welcomes suggestions from the foundry, which will give greater assurance of soundness in castings, or will reduce the cost of their production.

Co-ordination of ideas and principles of designing and founding can be brought about only through the intermediary of the foundry sales department. As in the case of patterns, the sales department gets its information from the operating department and transmits it to the designer. Again we see that close co-operation between operating and sales is indispensable.

In making these remarks, I am conscious of the fact that many members of the foundry sales organizations are exceptionally competent and well versed in foundry technique, and in numerous instances can state the foundry's position without consultation with the operating department. However, in these fast changing times, progress and development are making great strides in the steel foundry just as in other lines of endeavor, and with new knowledge gained through research and development, the operating executives, obviously are in the preferred position to say what is best from the manufacturing standpoint.

In the previous discussion, we have touched only those phases where the customers, by making concessions to the foundry, can render a service of mutual advantage. Let us now consider this from the opposite angle, viz: what the foundry can do to render better service to the consumer.

Delivery of Product

It is only through the sales department that the foundry is advised as to the customer's requirements respecting deliveries and the desired characteristics of the castings. The average operating executive, if left to his own choice, naturally would make the castings on order, in the order of their intricacy or difficulty, starting with the easiest; and if sufficient new work of the more simple grades were forthcoming, the *stinkers* would lie on the pattern shelf indefinitely.

Only through well regulated planning of the sales department through one of its branches familar with the purchasers' requirements, will the castings be made in proper sequence to satisfy each customer. There also must be the full co-operation of the operating department in making the castings in order of their priority, regardless of the effort and time necessary to produce them satisfactorily. Close co-operation of operating and sales departments again is indispensable, for satisfied customers supply the only solid foundation for permanent business.

Should the customer require castings of unusually good appearance, or from a special metal which characteristics best suit the work required of that casting, the sales department must obtain all available facts to assist the operating department in making the castings so that the desired results may be obtained. Co-operation alone brings about such a condition.

Relationship between cost and selling price now will be discussed. The difference between the two is, of course, vital to the life of any business. We recall one foundry of many years ago whose selling policy was to get the business at whatever price it could, and then put the order into the shop with the hope that the operating department could make the castings at a cost which would net a profit. When accepting business, practically no consideration was given to the character of the work, the in-

tricacy of design, nor the probable high cost of certain jobs. Not only was there no co-operation between the operating and sales departments in that plant, but there was, in fact, little contact. The patterns supplied were used as they came in or the foundry bore the expense burden to alter them. There was a woeful lack of information as to the nature of the service for which the castings were intended, and in many cases the orders for castings were taken at flat prices, disregarding the possibility that a major portion of the castings might be extremely high cost jobs.

As might be expected, the net results of that plant's operations were far from satisfactory, and it was constantly in financial difficulties. A spirit of co-operation and mutual helpfulness between the operating and sales departments undoubtedly would have changed the whole complexion of this plant's outlook, and would have assured it a marked success, as it enjoyed a strategic position from the standpoint of marketing. In those days the policy of this plant was not peculiar to itself, but was in force in many foundries. Only those foundrymen who now follow a different procedure can lay claim to a fair degree of success at present being achieved.

Methods are Changing

We are thankful that the progressive foundry of today has departed from these old methods. Through the accumulation and tabulation of statistics, both on entire production and on specific jobs, the cost of producing each individual casting is known. Fairness to maker and user demands that each job should bear its own burden. If the castings are taken at a price lower than the cost, the foundry doing so is robbing itself of legitimate profits, endangering its existence if examples of this kind are repeated sufficiently.

It is not the purpose of this paper to dicuss price fixing nor specifically to advocate the use of job costs. However, as the knowledge of costs, both general and specific, is fundamentally essential to successful merchandising, we can not refrain from mentioning sales price in so far as it may be affected by the co-operation of operating and sales departments. The sales department, through its contacts and by the nature of its work, is familiar with the market price of the product it sells. Many times this price is below the immediate cost of that product in its foundry. We will mention two solutions which may be applied with a reasonable chance of success in many instances.

As the sales department knows, or should know, the requirements of the customer, the personnel of his organization, and his appraisal of quality and service, it often is able to secure a selling price commensurate with the cost, providing the operating department produces a casting of excellent quality and renders exceptionally good delivery. By the nature of the process all castings cannot be perfect. Neither can all orders on the book be produced simultaneously. If the sales department, co-operating closely with the operating department, keeps it advised when conditions are such as represented, and the operating department reciprocates by a little extraordinary effort, the castings and service may warrant the customer's placing the business at prices commensurate with service.

Choose Profitable Work

It may happen now and then that the sales department, knowing the customer's requirements, and learning that suitable castings may be purchased at a price which is lower than its own plant's cost, by giving this information to the operating department, may enable it to effect savings in short cuts, and changes which will lower that cost below the selling price obtainable. This may be accomplished in many ways, such as a knowledge of future orders of the same part justifying additional pattern equipment or a change of design suggested by the operating department which naturally reduces the cost of manufacture, or, by a careful study of the methods employed, enabling the operating man to make changes which will effect the required saving. We have known of steel foundries actually constructing and starting production on as many as 175 patterns in one month. Add to this several times that number of items from patterns previously made. You will appreciate that this intensive study of each job is not possible without an organization that would, in some industries, be regarded as out of all proportion to the sales value of the product. With the knowledge the sales department should have, selective jobs often can be chosen where such changes are practical and profitable. Again we see that close co-operation between operating and sales departments is quite indispensable to success of a steel foundry.

We know that the points we have tried to make do not embrace all of the arguments in favor of close co-operation between the departments of a foundry organization. What we have said however, with what we have learned but not tediously related in this paper convinces us, as we believe it would any student of the problem, that ignorance is responsible for a large part of the poor selling so common to our industry. If the thoughts expressed stimulate at least a little reflection and discussion which will help some steel foundry in solving an ever-present problem, we will feel well paid for our effort to promote what we regard as constructive policies that aid all intelligent producers and consumers.

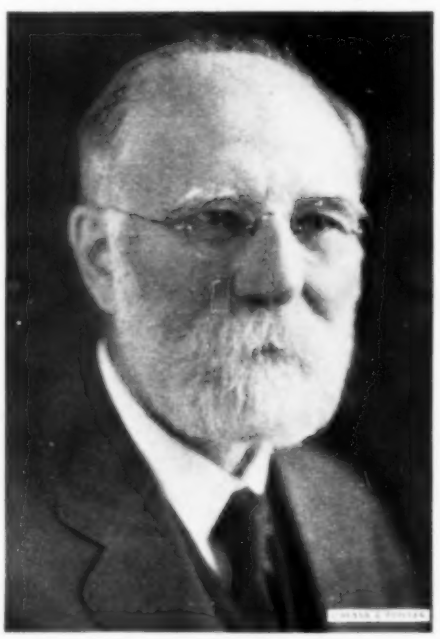
In the final analysis, the manufacturing and merchandising of steel castings present a problem requiring technique, tact, ability, and above all, good common sense, which are applied most profitably in an organization made up of individuals who know each other's problems and who work together closely and harmoniously. *The Interdependence of Operating and Sales Departments in the Success of a Foundry*, is nothing more than the exemplification of the well known slogan, which has carried to success, many an enterprise, commercial, civic, and national: *In Union There Is Strength.*

Nonferrous Shop Opens in New Quarters

Steady increase in volume of business once more has forced the Gluntz Brass Co., Cleveland, to move to larger quarters. The first modest little place was burned after a year's operation. A new plant was built on East Fifty-fifth street in 1924 and operated continuously under steadily increasing pressure. On Nov. 12, 1928, equipment, supplies and activities of the company were moved to a commodious and well appointed foundry located close to the Erie railroad at 108th street. This foundry was built in 1917 by the K. & M. Aluminum & Brass Co., and was operated until about two years ago when it was closed, but not dismantled. This latter feature greatly facilitated the transfer of activities from one plant to the other. For example the last heat in the old plant on Fifty-fifth street was poured Saturday, Nov. 10 and the first heat was poured in the new plant Monday morning, Nov. 12. The company handles a wide and miscellaneous line of general castings in practically all nonferrous metals and has accommodation in the new plant for 30 molders.

The Metropolitan Brass Founders' association held a fellowship session at Oakland's Terrace, New York, Oct. 24. Fourteen members attended this meeting which was devoted entirely to social acquaintanceship.

The FOUNDRY Family Photograph Album



Upper Left

J. S. SAMMONS
American Foundry Equipment Co., Mishawaka, Ind.

Lower Left

H. E. BULLOCK
Illinois Malleable Iron Co., Chicago

Upper Right

H. S. CHAFEE
Builders Iron Foundry, Providence, R. I.

Lower Right

C. H. HERTY JR.
United States Bureau of Mines, Pittsburgh

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

NONFERROUS METAL SPECIFICATIONS

(Continued from Data Sheet No. 742)

Specification No. 12, Babbitt

	Cast Products Per Cent	Ingots Per Cent
Antimony	9.50 to 11.50	10.25 to 10.75
Copper	2.25 to 3.75	2.75 to 3.25
Lead, max.	26.00	25.25
Tin, min.	59.50	60.00
Iron, max.	0.08	0.08
Bismuth, max.	0.08	0.08
Zinc and Aluminum	None	None

General Information: This is a relatively cheap babbitt and is intended for bearings subjected to moderate pressures. It is also suitable for die castings.

Specification No. 13, Babbitt

	Cast Products Per Cent	Ingots Per Cent
Tin	4.50 to 5.50	4.75 to 5.25
Antimony	9.25 to 10.75	9.75 to 10.25
Lead, max.	86.00	85.50
Copper, max.	0.50	0.50
Arsenic, max.	0.20	0.20
Zinc and Aluminum	None	None

General Information: This is a cheap babbitt and serves successfully where the bearings are large and the service light. It should not be used as a substitute for a babbitt with a high tin content. It is also suitable for die castings.

Specification No. 14, Babbitt

	Cast Products Per Cent	Ingots Per Cent
Tin	9.25 to 10.75	9.75 to 10.25
Antimony	14.00 to 16.00	14.75 to 15.25
Lead, max.	76.00	75.25
Copper	0.50	0.50
Arsenic, max.	0.20	0.20
Zinc and Aluminum	None	None

General Information: This is a cheap babbitt and serves successfully where the bearings are large and the service light. It should not be used as a substitute for a babbitt with a high tin content. It is suitable for die castings.

(Continued on Data Sheet No. 744)

NONFERROUS METAL SPECIFICATIONS

(Continued from Data Sheet No. 743)

ALUMINUM ALLOYS

Specification No. 30, Aluminum

	Per Cent
Aluminum, min.	90.00
Copper	7.00 to 8.50
Zinc, max.	0.20
Silicon, Iron, Zinc, Manganese and Tin, max.	1.70
Other Impurities	None

General Information: The tensile strength of test-specimens about ½-inch diameter of this alloy cast in sand and tested without machining off the skin should be about 18,000 to 20,000 pounds per square inch and the elongation 1 to 2 per cent in 2 inches.

This is a light alloy having a specific gravity of about 2.83 and is used more extensively in the automotive industry than all other light casting alloys combined. A shrinkage of 0.156 (5/32)-inch per foot should be allowed in pattern designs. This alloy is used for crankcases, oil-pans, steering-wheel spiders, differential carriers, transmission cases, camshaft housings, hub-caps and similar parts.

Specification No. 31, Aluminum

	Per Cent
Aluminum, min.	81.00
Copper	2.25 to 3.25
Zinc	12.50 to 14.50
Silicon, Iron, Manganese and Tin, max.	1.70
Other Impurities	None

General Information: The tensile strength of test-specimens about ½-inch diameter of this alloy cast in sand and tested without machining off the skin should be about 25,000 to 30,000 pounds per square inch with an elongation of more than 1 per cent in 2 inches.

The specific gravity is about 3.0 and a shrinkage of 0.156 (5/32)-inch per foot should be allowed in pattern designs.

This alloy is used extensively in England for such parts as crank-cases, oil-pans, steering-wheel spiders and transmission cases.

Specification No. 32, Aluminum

	Per Cent
Aluminum, min.	85.50
Copper	11.00 to 13.50
Zinc, max.	0.20
Silicon, Iron, Zinc, Manganese and Tin, max.	1.70
Other Impurities	None

(Continued on Data Sheet No. 745)

Metals and Melting

How Metallurgical Problems Have Been Solved in Gray Iron, Malleable and Steel

Dirty Iron Results in Defects in Castings

Question—We are sending four samples of a casting showing a small defect in each, and would like to learn the cause of the defects. The iron is melted in a cupola lined to 72 inches inside diameter. A positive pressure blower with from 10 to 12 ounces blast pressure is used. The lower row of the double tuyeres is 20 inches from the sand bottom and top tuyeres are 54 inches above the bottom. The coke bed is 40 inches above the bottom tuyeres. Each charge is made up 2000 pounds iron, 270 pounds coke and 60 pounds limestone and 20 pounds fluorspar. We melt continuously 10 hours a day, tapping into a 1000-pound mixing ladle and skimming the slag in the spout by means of a trap. The mixture consists of:

	Per cent
Northern pig iron	43
Electric furnace ferrosilicon—	
10 to 12 per cent silicon	3
Sprues and scrap	39
Cinder iron	3
Stove plate	12

The sample of iron sent you was analyzed and found to contain:

	Per cent
Silicon	2.04
Sulphur	0.077
Phosphorus	0.992
Manganese	0.42
Total carbon	3.46

Iron at the spout is between 2550 and 2575 degrees Fahr. as indicated by an optical pyrometer.

Answer—The samples received indicate shrinkage and dirt. This may be caused by the composition of your metal or by your melting practice. In noting the analysis of the iron, the features that stand out are the high phosphorus and total carbon and the low manganese. Using northern irons, you should be able to get much lower phosphorus than you do. In fact, many foundries making automobile cylinders use malleable bessemer pig iron keeping the phosphorus down to 0.2 per cent.

The manganese content should be at least above 0.5 per cent and would be better between 0.6 and 0.8 per cent. The addition of 15 per cent steel scrap in the mixture would be advisable, in case the pig iron contains an excess of carbon. This addition of low carbon metal will lower the average carbon in the mixture. Stove plate scrap is good for mixtures for certain classes of castings but the phosphorus is apt to be high, and you should determine that the scrap is not highly oxidized.

Your melting practice appears to be satisfactory except that the top tuyeres are within a few inches of the top of the bed which is apt to cause oxidation in the metal and the absorption of oxides by the iron which are not subsequently reduced. This would cause dirty iron and increase tendencies to shrinkage.

Melting Semi-Steel

Question—I would like to know in what way the cupola practice for making semisteel differs from that used when melting gray iron.

Answer—In general, the melting process is similar to that for cast iron. One precaution necessary is to see that sufficient coke is always used. In charging the cupola, steel is first added on the bed, then pig iron, and after that the scrap iron. From 5 to as high as 50 per cent of steel can be used.

However, when the latter extreme is encountered care must be taken in melting to get the proper temperature as the iron sets rather quickly. It is also well to add limestone on each charge, about 50 pounds to 1000 pounds of metal is usually sufficient to give a thin slag. A mixing ladle with a capacity of a charge or a charge and a half should be placed at the spout to insure a uniform mixture for pouring. The manganese content should be increased either by the use of high manganese pig iron or by the use of ferromanganese.

Use for Old Crucibles

Question—We have several carloads of used broken crucibles on hand and would like to know where to dispose of them. Do steel foundries use this material?

Answer—Steel foundries sometimes use old crucibles in the powdered form for mixing with clay and sand to daub ladles and pouring spouts, but this is done only in a limited way. At present broken crucibles are a drug on the market.

Melts All-Scrap Charges

Question—What amount of 50 per cent ferrosilicon should we add to a charge consisting of 100 per cent scrap. We have no pig iron at present and want to make soft castings with about ½-inch section. Our scrap is an average grade.

Answer—The best alloys to add to cupola charges consisting of all gray-iron scrap are a low-silicon ferrosilicon, with about 10 per cent silicon, and spiegeleisen. These should be added in the proportion of about 10 pounds of ferrosilicon and 2 pounds of spiegeleisen to 100 pounds of scrap.

If you do not have these ferroalloys you can use 50 per cent ferrosilicon at the rate of about 2 pounds to 100 pounds of scrap. Owing to the fact that this grade of ferrosilicon is oxidized readily you should be careful in using it not to have too high a blast pressure. Another precaution sometimes taken is to encase the ferrosilicon in a thin paste of a mixture lime and clay. Eighty per cent pea-size ferromanganese added to the ladle in the proportion of about ¼-pound to 100 pounds of metal will be of benefit in such a metal as you propose to make in case you do not have spiegeleisen.

The amount of ferrosilicon recommended is just approximate. You may find that you can get along with less, but it would be well to start with the larger amounts.

Chemist Must Apply Data

Question—Please advise us whether it would pay us to install a laboratory for analyzing all the iron, brass and coal that we use. We have none at present but employ a young man who has a fair knowledge of chemistry and think we could let him learn to make analyses.

Answer—If you secure a chemist who is familiar with the properties of the metals and has a practical turn of mind, an analytical laboratory would be of great use to you. But we do not believe you would get much benefit from a laboratory operated by a man who had little experience in metallurgy. While it is desirable that a foundryman should know the composition of the fuel and metals he uses, unless this information is applied to advantage it is of minor value.

Melting Iron in the Cupola

Part VII

By J.E.Hurst

METHODS of handling and charging materials into shaft-furnaces have occupied the attention of furnace engineers from time immemorial. In earliest times, the problem of charging was solved by the choice of a site, in which the shaft furnace was located on a hillside, where the material could be collected and stored on the higher level and charged direct by hand labor into the furnace. Simplicity of this arrangement can be maintained on any site by lowering the cupola below the ground level in such a manner that the charging door is in a line with the ground level. Such an arrangement described within comparatively recent years is diagrammatically illustrated in Fig. 40.

Mechanical methods for raising the materials to the higher level of the charging hole commonly were preferred to an arrangement as in Fig. 40. In present days of large unit foundries and high labor charges, increasing attention is paid to the problem of mechanical handling of materials in all departments of the foundry with the object of conserving both time and labor. Mechanical handling of materials to the cupola has received its full share of attention. Simple mechanical methods of the early days have had to be elaborated extensively. Vast ingenuity has been displayed by engineers and foundrymen in this direction, to meet the many and various requirements of modern foundry practice.

A work of this nature cannot describe all the apparatus, combinations of apparatus and arrangements that have been designed for cupola charging purposes. No one type or arrangement possesses the quality of universal utility under the wide variety of existing conditions. Method of cupola charging, and consequently the type and arrangement of the charging apparatus is connected intimately with the layout of the cupola plant, in relation to the foundry floor and stock yard; degree of accuracy of control necessary over all the various components of the charge; labor costs and other local conditions.

Charging Improves

CONDITIONS have changed to a material extent since the old days when cupolas or melting furnaces were erected on the side of a hill so that the materials forming the burden might be dropped in through the open top with a minimum of effort. Many cupolas, particularly those running on comparatively light heats, still are charged by hand from materials stacked on the charging floor. In the larger cupola installations the tendency is toward mechanical charging. Modern cupolas running on long heats are as completely mechanized as blast furnaces. Equipment employed for charging cupolas ranges from a simple jib crane which deposits the charge on the scaffold, to an elaborate system of crane, magnet and bucket which handles the materials at every stage from the incoming freight car to the interior of the cupola.

Charging a foundry cupola can be divided under three principal headings as follows: 1—Collecting the requisite quantities of the components of the charge; 2—raising this collected material to the charging door level; 3—charging this material into the cupola shaft.

Complete mechanical charging involves the use of mechanical equipment for performing all these three operations. Degree of completeness depends upon how far these operations are performed by mechanical means.

Foundrymen generally are interested specially in the mechanical performance of the third item, charging the material into the cupola. They consider, and rightly so, that to obtain the best results in the working of the cupola, and in the character and quality of the melted mixture great care should be taken in the distribution of the charge. Opinion still is held by many foundrymen that this operation is performed best by hand methods. Necessity for regular and uniform distribution of the charge is common to all shaft furnaces. In modern blast furnaces, carefully designed and elaborate arrangements of mechanical methods, involving double bells and rotating distributors, have been evolved to ensure this regularity and uniformity. So far it has not been found necessary or possible, to introduce blast furnace methods into cupola charging practice.

In considering this question of mechanical charging *versus* hand charging, it is necessary to maintain a correct sense of proportion. Relation between normal size of materials used and volume of the respective charges in small cupolas is such that little difference will be found in the regularity and uniformity of the charges, fed in small quantities by hand, or charged in larger volumes mechanically. As the diameters are increased in proportion to the size of the materials charged, the danger of irregularity in the charging increases. Tendency is to charge into the center and to neglect the edges. Modern devices are designed to take this into consideration. Irregularity in charging is by no means greater than occurs in hand charging in the ab-

sence of constant labor supervision.

During recent years mechanical methods of charging have developed extensively beyond the stage of lifting the material to the charging level. Following the natural line of development of complete mechanical charging, these methods of lifting in the first place will be reviewed briefly.

Probably the simplest form of lifting device is the hand-operated jib crane, still to be found in some of the small old-fashioned cupola plants. The crane was erected on a staging around the cupola, at or about the charging level. The charges, assembled in skips or on trays, were hoisted to this level by the swinging arm and deposited on the stage, from whence they were charged into the furnace by hand. A large scale development of this method of raising the material to the charging level still is in efficient operation in several foundries.

In one large installation, a mechanically-operated crane with an 80-foot jib is arranged to sweep the stock yard and to raise the material on flat trays to the charging level of the cupola. This arrangement is comparatively simple, but it has a number of defects which are overcome by other apparatus of an equally simple nature. The arrangement does not lend itself to a convenient layout of the stock yard. The stocking area is limited to the maximum radii of the crane. Also it is slow in operation and places too much reliance on the continued judgment of the operator.

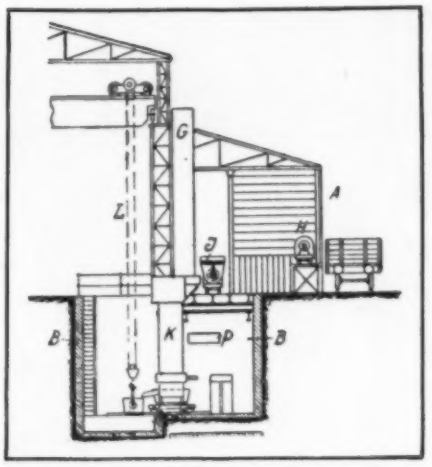


FIG. 40—CUPOLA ARRANGED FOR GROUND LEVEL CHARGING

The cage hoist constitutes the most common device for raising material to the charging level. The material is loaded at ground level in barrows, or trucks, which are hoisted in the cage to the charging level. All forms of power, including steam, electric, hydraulic and pneumatic, have been adopted for operating such hoists. Electrically-operated lifts probably are most common today. A common type of electric hoist is that in which the cage is lifted by a rope passing over a grooved drum, erected on top of the well shaft. The shaft frame is constructed of steel with four well-seasoned pine wood guides bolted to the corners of the steel tower. The two back guides usually are grooved to receive the balance weight. Generally a corrugated sheeting roof is supplied to house the winch and motor at the top of the shaft. The cage is balanced and the winch is operated by a suitable motor at a hoisting speed of about 80 feet per minute. Push button control can be arranged on the lift itself, or on the landings. Safety gear, automatic stops to prevent the car traveling beyond the landings, mechanical and electrical braking generally are provided to ensure complete control of the lift. Usually the lift cage is provided with narrow gage track rails registering with the track serving the stock yard. Wheeled trucks may be run direct from the stock yard to the lift. With similar rails on the staging the material easily can be led direct to the cupola charging door.

Use of a cage lift or hoist in its simplest form relies on assembling

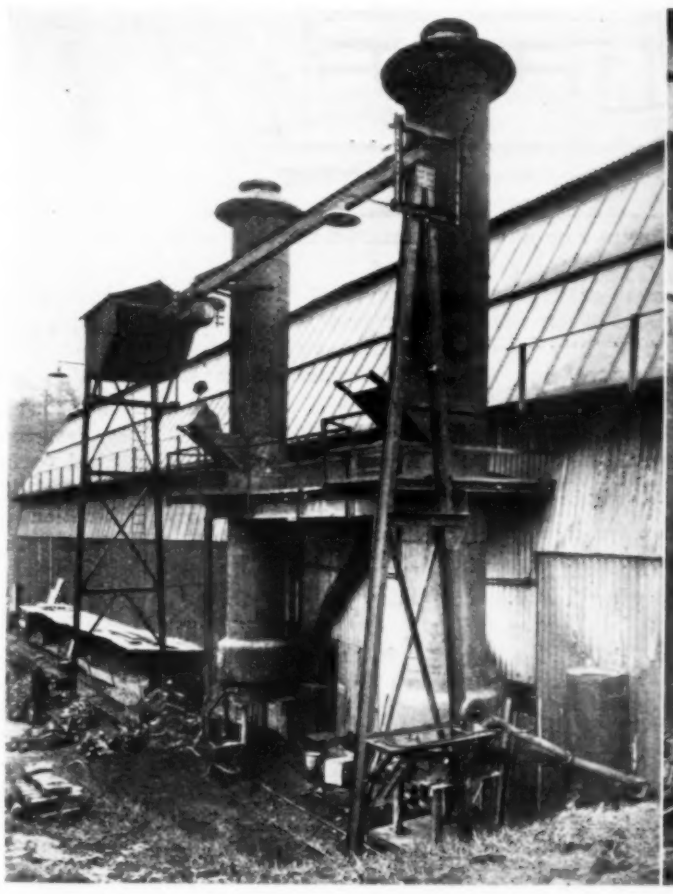


FIG. 41—TILTING BUCKET AND TRAVELING HOIST ARE APPLIED TO CHARGING THE CUPOLA. FIG. 42—AN ELECTRIC MOTOR IS EMPLOYED TO HOIST THE BUCKET WHICH RETURNS BY GRAVITY UNDER BRAKE CONTROL

FIG. 43—CHARGES ARE MADE UP IN SPECIAL TIPPING CARS AND CONVEYED TO THE CHARGING DOOR ON A TRANSFER CAR

charges in the stock yard and delivery of these from the charging platform into the furnace by manual labor. In many of the larger plants efficient layouts have been designed around the simple hoist as the main lifting appliance. The staging is provided with a number of lines of track to receive special tipping bogies delivered from the hoist to the tracks by a transfer car and which then are tipped into the charging hole of the cupola. With a sufficient supply of trucks this arrangement presents an efficient application of the vertical cage hoist to cupola charging shown in Fig. 43.

In many instances the hoist is used solely for raising materials from the main stock yard to the charging stage level. A secondary stock of material is maintained on the stage which is equipped with a weighing machine. Charges are made up and thrown into the furnace by hand, directly from the stage. Pig iron is broken into suitable sizes in the stock yard before delivery to the stage.

The simple inclined hoist and car for carrying barrows or trucks of material to the stage level, similar in design to that frequently used in the older methods of charging blast furnaces does not appear to have been adopted in cupola charging.

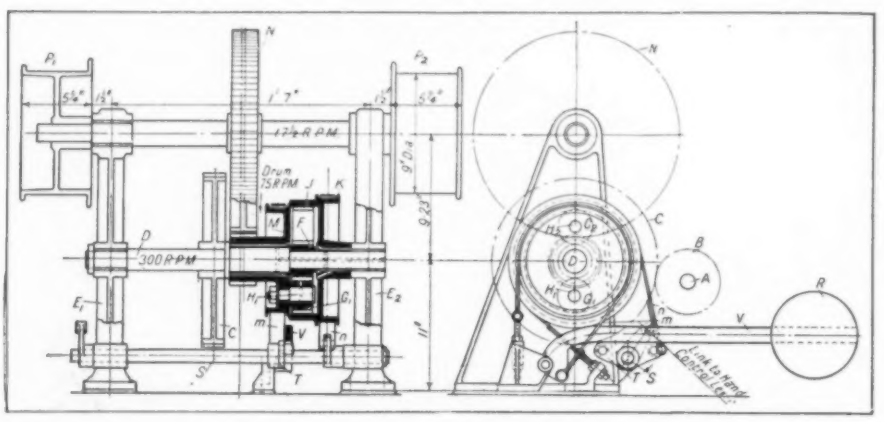


FIG. 44—SECTIONAL SIDE ELEVATION AND END VIEW OF POWER DRIVEN HOISTING MECHANISM

In many of the cupola plants where large quantities of material are handled, the overhead crane traveling on parallel gantries is adopted. Charges can be made up at the ground level and raised in suitable skips or trays to the charging level, or, a secondary stock can be maintained on the staging from which the charges are made up and charged directly into the furnace. Advantage of this method is that the crane gantries can be extended more or less indefinitely to cover a large range of stock yard. The stock yard can be arranged readily parallel to the railroad tracks and the services of the traveling crane can be requisitioned for unloading the cars of incoming material and storing it in the yard.

Mechanical charging systems may be defined as arrangements embodying both raising of material from the ground level, and charging it direct into the cupola without intervention of hand labor. At present practically every large cupola plant utilizes some form of direct mechanical charging, and the tendency even in small plants is to eliminate manual labor on the stage. An outstanding advantage in

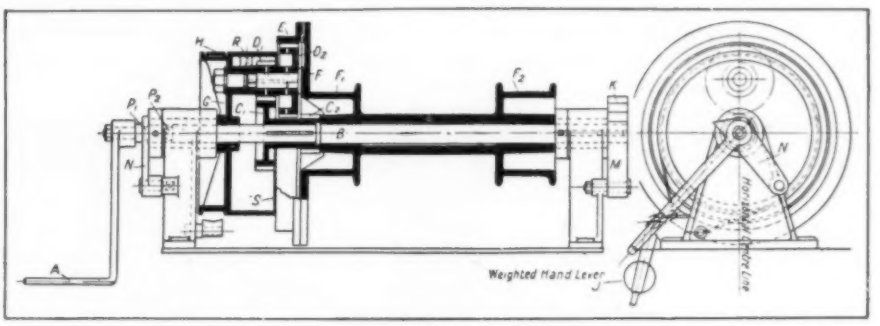


FIG. 45—ARRANGEMENT OF HOISTING GEAR FOR HAND OPERATED MACHINE

many of the smaller mechanical charging devices is the elimination of the staging, frequently an item of considerable capital expenditure.

Quite a wide variety of mechanical charging devices have been designed. Apart from detailed mechanical variations they can be classified as either one or the other, or combination of two classes, according to whether the material is tilted into the cupola from skips or buckets, or use is made of a form of drop bottom bucket.

In the simplest method of mechanical skip charging the skip charged with material is lowered on to the edge of chute, extending round the charging door. This layout is illustrated in Fig. 46, which shows the design of a skip and chute as used on a 3-ton per hour cupola, working with individual 500-pound metal charges. With a full load the skip remains in the horizontal position by

stops bearing against a yoke. A stop is provided in front and on lowering the skip on to the cross member of the chute, the skip automatically tips the charge into the chute.

A simple arrangement for two cupolas utilizing a traveling pulley block for lifting and lowering the skip, is illustrated in Fig. 41. The skip is shown in the tilted position. The hoist is of the traveling pulley block type, with electrical raising and traveling motions. When operated with direct current the controls can be mounted readily at ground level. Use of an inclining device insures accurate location of the skip over the respective chutes. The arrangement illustrated in Fig. 42 utilizes a bucket with a metal capacity of 500 pounds and of robust construction with renewable wearing strips. The chute itself is provided with a renewable mild steel wearing plate and sill. Installation of this arrangement is low in first cost, and maintenance and upkeep are small.

Where such an arrangement is operated from the ground level, and the bucket is out of sight of the operator, an indicating device readily can be arranged by a wire passing over suitable pulleys. Exact locating also can be provided electrically by suitable contactor gear and dynamic braking. This system of mechanical charging can be modified by the adoption of various types of lifting gear which, of course, increases the cost of the installation considerably.

A simpler arrangement still is a chain and bucket type elevator. All staging is eliminated definitely and the buckets discharge into a suitable single or double chute serving one or two cupolas.

A chain and bucket elevator utilizing a single bucket, is illustrated in Fig. 42. This machine is made in three sizes, with bucket capacities of approximately 3¼, 7 and 16 cubic feet respectively. Method of operation is clearly visible from the illustration. To obviate the use of a reversing motor an ingenious adaptation of a continuously running motor has been devised. All the motions of the bucket are controlled by one lever. Return of the bucket is effected by gravity under the control of a brake operated by a hand control lever within reach of the operator. If the hand lever is released, the bucket automatically is brought to rest easily at the bottom of the elevator.

The hand-operated charging machine designed for use with dwarf cupolas or cupolets does away with the necessity of a staging. The cupola may be charged and manipulated by one man. The bucket mounted on two wheels is provided with small projections on either side, which engage a series of pins fixed near the top of the framework and tip the bucket, its contents falling into the cupola. The patented hoisting gear is designed for two lifting speeds, one for coke and the other for iron charges. It has a nonreversing crank handle and the empty bucket returns by gravity.

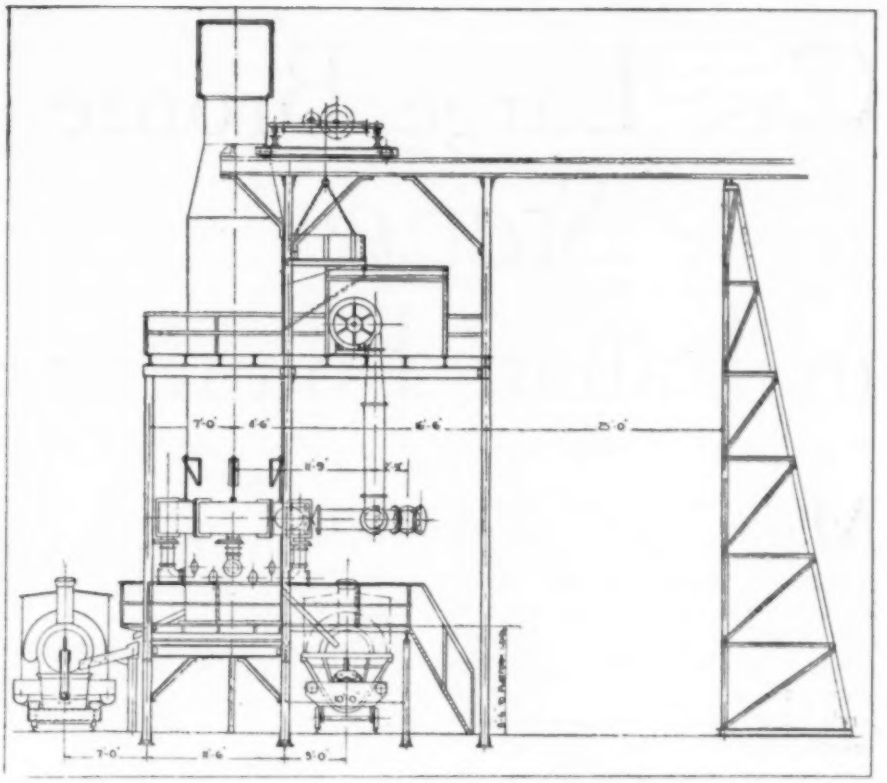


FIG. 46—THE BACK OF THE CHARGING PAN RESTS ON THE EDGE OF THE CHUTE. WHEN THE HOIST COMES DOWN THE PAN TIPS AND DISCHARGES THE LOAD INTO THE CUPOLA

Shrink Holes Found in Gear Blanks

Question—We are sending you a broken section of a blank gear which has been causing us much trouble. These gears machine clean on the milling operation and the defect does not show until the tooth-cutting operation which makes them expensive scrap. We have tried everything we could think of to overcome this difficulty and as yet have been unable to do so. The composition of the metal is as follows: Silicon, 2.00 to 2.10 per cent; manganese, 0.50 to 0.60 per cent; phosphorus 0.30 to 0.45 per cent; sulphur, 0.08 to 0.10 per cent, and total carbon 3.50 per cent. Our cupola practice, we believe, is good. We do not think that our trouble is from this source, because we have no difficulty with plain gears, that is, gears without the web. We have drawn the conclusion that this web has the bad influence on the rim. Any information that you can give us on this problem will be greatly appreciated.

Answer—The composition of the metal should be modified somewhat. Silicon should be lowered to about 1.6 to 1.8 per cent. It would be better to have the manganese slightly above 0.6 per cent than under this amount. The phosphorus should be held near your lower limit of 0.3 per cent, while the sulphur could be run as high as 0.12 per cent without causing any difficulty. You do not say whether you use any steel in the mixture. If not, the addition of 15 per cent steel would be of benefit. Also, the metal should be poured hot from a downgate in the hub. With these precautions you should get a solid blank, but in case the trouble continues to any degree, a riser on the rim above the place where the holes occur would be of assistance. Even with all these precautions you would be apt to get holes in your casting if the iron is not properly melted. So many steps in the operation must be watched in the produc tion of castings that it is difficult in all cases to point out a remedy without making a full study of all the operations.

Of course the web on this gear blank tends to make it more difficult to get a sound casting but the design is not so radical as to make it impossible to secure sound castings if the metal is in the right condition.

Cast Large Bronze *Statue* in Italian Foundry

The Statue Named "Statua della Vittoria" Has a Total Height of 80 Feet and is Composed of 5 Separate Parts. Each Piece Weighed Several Tons and Was Made by the Lost Wax Process in the Foundry of the Fonderia Francesco Riva, Turin, Italy. The Statue Weighed Over 20 Tons When Assembled

MANY countries, participants in the late war, have memorials commemorating various events or honoring heroes of that period. Italy recently erected a war memorial near Turin of exceptional size and beauty. The monument is a bronze statue of winged Victory raising a torch in her right hand and a laurel wreath, the old Roman token of victory, in her left. Some idea of the size of this monument may be gained by comparing the size of the men in the accompanying illustration with that of the statue and base.

The statue towers 62 feet with the base 18 feet tall, makes a total height of 80 feet. The monument is named "Statua della Vittoria" and was executed by the well known sculptor Edoardo Rubino. It is situated on the top of a hill near the town of Turin, Italy, and is visible from a great distance in the surrounding country, especially at night when the torch, which is lighted by electricity, is in service.

Of special interest to the foundrymen is the fact that the statue is a bronze casting, claimed to be one of the largest in the world. The casting was made in the foundry of the Fonderia Francesco Riva, Turin, Italy, and was four months in the making. The casting was made in five separate parts, each part weighing several tons. The pieces were produced by the lost wax process which previously has been described in THE FOUNDRY.

About 26 tons of bronze were used in making the casting. The metal used was an Italian admiralty bronze alloy in which no lead was allowed. The metal was melted in a battery of reversible oil fired furnaces, each having a capacity of about 800 pounds. When it was ready for casting, enough metal was poured into a large ladle to fill the mold and the piece was cast from one ladle. The same process was used in making each of the pieces which make the statue. The castings were cleaned in the usual manner and the parts were assembled. Roman or bolted flange joints are used for assembling this class of work. In this instance, both types probably were used.

Engineers Discuss the Hot Blast Cupola

Several problems of the foundry industry were considered at the National Iron and Steel meeting held under the auspices of the American Society of Mechanical Engineers at the Palmer House, Chicago, Nov. 14 and 15. A bearing metal and lubrication session was held on Thursday morning, Nov. 15, with A. J. Boynton, vice president, H. A. Brassert & Co., Chicago, presiding.

At a Wednesday afternoon session, F. K. Vial, vice president, the Griffin Wheel Co., Chicago, discussed "The Hot Blast Cupola." In describing the development of that equipment, Mr. Vial stated that practically the same amount of air will be required to combine with the carbon of the fuel, regardless of the temperature of the blast. The only effect of the hot blast is to carry a certain amount of heat to the combustion zone, which in turn will result in an increased temperature. This will result in more perfect combustion.

Mr. Vial pointed out that the temperature of the gases after passing two charges of iron will be about 1500 degrees. At this point it was assumed that approximately 40 per cent of the gases of combustion are drawn from the cupola to supply the necessary heat in the recuperator, leaving 60 per cent to pass upward through the remaining charges. On account of the reduction in the amount of gases passing through the remaining charges the velocity will be 60 per cent of that in ordinary practice, hence, as the time element is increased 40 per cent, the temperature of the gases will be reduced to a point considerably lower than in the ordinary practice. For the purpose of the heat balance it was assumed that 60 per cent of the initial gases of combustion escaped from the uppermost charges of the cupola at a temperature of 600 degrees Fahr.

The analyses of the gases of combustion taken from the cold blast and hot blast cupolas of the same diameter and operating at the same

time at the same plant, indicate that a large part of the saving in fuel in the case of the hot blast arises from more complete combustion, and also furnishes a key to the use of heat balance tables for hot and cold blast. Mr. Vial stated that the application of the hot blast cupola and the increased knowledge of alloys and heat treatment should enlarge the field of gray iron.

L. E. Christopher, Buckeye Brass & Mfg. Co., Cleveland, discussed bronze metals in his paper on "Nonferrous Bearing Metals," which was presented at the technical session devoted to bearing metals and lubrication. He cited the popularity of the No. 40 red brass classification, the No. 62 or Navy G hard cast, No. 64 phosphorus bronze and the No. 67 semiplastic bronze, pointing out special adaptabilities of each for various purposes. The lead content of No. 40, used widely in building machinery, has special features enabling clean castings and facility in machining. The speaker cited the Navy G metal as decidedly popular for bearings owing to its capability to resist stress and the advantages of the high lead content.

The No. 64 phosphorus bronze does not change its structure with the addition of phosphorus, he pointed out, and care should be used in the addition of phosphorus after complete removal of oxidization is accomplished. The No. 67 semiplastic bronze was cited as worthy of important consideration when bearings are located disadvantageously for oiling. Tests made in his plant showed lubrication necessary after 270 hours of continuous bearing service. He warned against the engineering practice of cutting of excessive oil grooves in bearing metals, so as to avoid needless "chopping" of the bearing surfaces. General discussion brought out the trend toward wider use of the standard mixtures for bearing metals for various purposes.

Gray Iron Institute Makes Progress

REAL progress is reflected in the summary of activities of the Gray Iron institute reported at its first annual convention held at the chamber of commerce, Cleveland, Nov. 14. Walter L. Seelbach, Forest City-Walworth Run Foundries Co., Cleveland, president of the institute, reviewed activities since placing the affairs of the organization in the hands of Arthur J. Tuscany, manager. He stated that members report that already many evidences are shown that unfair practices have been abated due to the mere existence of the institute.

Manager Tuscany who has been devoting his major effort since his appointment in July to broadening membership, reported 83 active members and a number of applications which soon will bring the membership over the century figure.

H. S. Chafee, Builders' Iron Foundry, Providence, R. I., treasurer, gave a brief summary of the financial status of the institute. B. H. Johnson, Cresson-Morris Co., Phildelphia, vice president and chairman of the research committee, reported on the organization of this committee to forward research interests. Don McDaniel, Hamilton Foundry & Machine Co., Hamilton, O., reported the tentative appointment of a merchandising committee to study distribution problems of the gray iron industry. Edward B. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill., chairman of the finance committee, outlined plans for the organization of that committee. A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., vice president of the institute, reported on plans for co-operation with existing organizations in other branches of the foundry industry and dwelt on the opportunities for cost study which now may be pursued, due to the establishment of a definite organization.

The nominating committee consisting of H. J. O'Neil, Western Foundry Co., Chicago., chairman; William Bornfleth, Cream City Foundry Co., Milwaukee; Harry Cooke, Olney Foundry Co.. Philadelphia; Paul C. DeWolf, Brown & Sharpe Mfg. Co., Providence, R. I.; and David L. Sacks, Louis Sacks Foundry, Newark, N. J., presented the report of the nominating committee. The following directors were elected: For one year, J. D. Coltman, Bullard Machine Tool Co., Bridgeport, Conn.; Horace Culling, Carondelet Foundry Co., St. Louis; W. J. Grede, Liberty Foundry Co., Milwaukee. For two years, J. H. Bruce, Bowler Foundry Co., Cleveland; H. S. Chafee, Builders' Iron Foundry, Providence, R. I.; A. E. Clarke, Des Plaines Foundry Co., Des Plaines, Ill.; Fred Erb, Erb-Joyce Foundry Co., Detroit; Don McDaniel, Hamilton Foundry & Machine Co., Hamilton, O. For three years, J. L. Carter, Barlow Foundry Co., Newark, N. J.; B. H Johnson, Cresson-Morris Co., Philadelphia; Walter Seelbach, Forest City-Walworth Run Foundries Co., Cleveland; and Edward B. Sherwin, Chicago Hardware Foundry Co., North Chicago, Ill.

At a directors' meeting following the annual meeting the same officers who have served during the past organization period were re-elected. These are: Walter L. Seelbach, president; B. H. Johnson, vice president; A. E. Hageboeck, vice president; and H. S, Chafee, treasurer. These with J. L. Carter, Barlow Foundry Co., Newark, N. J., serve as the executive committee.

At a meeting of the old board of directors held previous to the general meeting of the institute, Dr. Hugh P. Baker, Washington, manager of the trade association department of the chamber of commerce of the United States, explained to the board the lines of development possible to trade associations under present government agencies. He emphasized the services which the government, chiefly through the department of commerce, offers to industry.

Appoints Committee

The Gray Iron institute, Terminal Tower building, Cleveland, has appointed a membership committee composed of the 75 members of the institute with Fred Erb, Erb-Joyce Foundry Co., Detroit, as general chairman. Assisting Mr. Erb in the various centers of the country are the following vice chairmen. W. F. Bornfleth, Cream City Foundry Co., Milwaukee; A. E. Clark, Des Plaines Foundry Co., Des Plaines, Ill.; Horace R. Culling, Carondelet Foundry Co., St. Louis; Chester A. Peebles, Stedman's Foundry & Machine Works, Aurora, Ill.; H. P. Messlor, John E. Thropp's Sons, Inc., Trenton, N. J.; D. L. Sacks, Louis Saeks Foundry, Inc., Newark, N. J.; R. R. Simonton, Ensign Foundry Co., Toledo, O.; H. E. Smith, Woodward Iron Co., Woodward, Ala.; Fred F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass. The institute also has announced that the following companies have been admitted as members to the institute: Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.; Pangborn Corp., Hagerstown, Md.; Lukomski Bros., Detroit; Alten's Foundry & Machine Works, Lancaster, O.

How and Why in Brass Founding

By Charles Vickers

Requests Bright Dip

One of our customers has requested a bright dip on aluminum castings. The alloy they are using is ordinary No. 12 *made from remelt aluminum and containing small percentages of silicon, iron, manganese, copper and zinc. It is desired to have a dip that will clean the castings and leave them with a bright finish after all the machine work and factory handling has been completed.*

The following method of dipping aluminum we take from publications of the British Aluminum Company, and is a method generally followed: After the castings have been lightly sandblasted they are dipped in a solution of caustic soda, 2 pounds to the gallon of water; they are removed, rinsed and then dipped in nitric acid, after which they are again rinsed and dried in sawdust.

Adds Phosphor-Copper

Could you tell us in making a phosphor bronze of the formula 80 *per cent copper* 10 *per cent tin and* 10 *per cent lead, what percentage of phosphorus would be the proper amount to use in this mixture, and what amount would be injurious, if any, and the nature and effect of the surplus amount?*

Phosphorus is used in all proportions in the alloy named, up to one per cent, but rarely above that in this country. Its effect is that of a deoxidizer in small amounts and a hardening agent in large amounts, but the higher the amount of phosphorus, the more difficult will it be to make sand castings. When the alloy is used for heavy bearings it is frequently phosphorized up to 0.7 per cent or higher and certain advantages are supposed to be gained thereby, from a bearing standpoint due to the combination of the copper and phosphorus into a hard and brittle phosphide which is distributed throughout the castings.

One disadvantage is that the phosphide has a tendency to segregate to the outer skin of the casting, there displacing the lead, with the result that the castings sometimes become difficult to machine and cause a lot of trouble to the founder. Pouring the bronze as cold as possible, so that it solidifies immediately in the mold has a tendency to check this segregation, or migration of the phosphide. When the bronze is deoxidized by the addition of 0.25 per cent phosphor copper, containing 15 per cent of phosphorus, we get a good casting alloy, but it is prudent to use a flux during the melting period even with that amount of phosphorus. Increase of phosphorus content brings reduced physical properties.

Eye Bolt Must Turn

We have an order for several thousand brass awning pulleys to have steel eye bolts cast in them. This eye bolt is not threaded and it is imperative that it be cast loose so that it will turn freely. Can you advise us which is the most economical method of doing this.

The shank of the eye bolt that has to be held by the brass will require to be dipped into linseed oil, and then be rolled in dry sharp core sand so that it gets a uniform coating of sand. Then hang the bolt on a stiff wire, on which many of the bolts can be threaded. The *string* then has to be placed in a hot oven and be baked like an oil sand core. Such treatment may not be the most economical way of doing it, but it is sure and certain as to results, if properly carried out.

How To Cast Round Rods

We are casting 6-inch and 7-inch, solid round bronze sticks, 12 *inches long and use both* 88-10-2 *and* 85-5-5-5 *as alloys. Please advise what you consider the most satisfactory method of making castings of this size and shape. Approximately what size risers would you recommend, and at what temperature would you suggest pouring?*

Bronze sticks of the diameter mentioned generally are cast "upright" in a well rammed mold. It is essential to use a molding sand considerably coarser than the ordinary *brass sand* grades, otherwise the castings will cut and scab. Work the sand as dry as possible, and if a complete cast iron drag is used, drill holes in it to allow the gases to escape freely. If the drag is built up, with *upsets* there is usually enough space between them to vent the mold sideways. In the case of green sand molds, brush on dry plumbago with a camels hair brush and polish the surface. The molds can be gated either bottom or top. An all-sand mold can be bottom gated, using a sprue of small diameter; over an inch is too large.

Have a riser on the upper end, nearly the diameter of the casting, and in pouring, use what is known in brass foundry parlance as *hot metal* and fill the mold about one inch into the riser. Then *touch up* this riser gently until it is filled. This touching up process is most important. Do not be in too great a hurry to fill the mold as the result will be a nice shrinkage cavity extending down into the casting. The casting must solidify before the riser. If the casting sets after the riser, the result may be a wonderful riser, but a silly looking casting.

Uses Nickel Alloy

We would appreciate your advice in regard to the best way of mixing the following alloy, with the possible addition of a small amount of silicon. The alloy we want to make is: 88.5 *per cent aluminum;* 2.65 *per cent of nickel;* 8.85 *per cent of tin.*

Nickel-aluminum alloys made especially for adding nickel to aluminum alloys now are commercialized. Some are higher in nickel than others, but we believe that an 80 per cent aluminum; 20 per cent nickel, will be found satisfactory as it easily dissolves in the aluminum when the latter is molten. The nickel also can be added as shot nickel with no pre-alloying, but it is necessary to heat a portion of the aluminum to a deep red color and hold it there until the nickel dissolves, which it does like sugar in water. This method is practised by die casters to a large extent and the nickel can be alloyed perfectly, even when the alloy is made in an iron kettle. It is a matter of choice which method is adopted, but the 80-20 *hardener* has the advantage of convenience.

Tin can be added after the nickel, especially when the metal is used. This permits the low melting tin to be added at a more suitable temperature. Silicon can be added as a hardener also, and as far as our experience goes, the 50-50 silicon-aluminum alloy is as good as any.

Properties of Cast Iron Are Related to Its Structure

By Edward E. Marbaker

MECHANICAL properties of gray cast iron depend upon the structure of the ground mass or matrix and the condition and distribution of the graphite in the cast metal after cooling. In ordinary gray cast iron the graphite separates out in large plates which tend to weaken the metal materially. In malleable practice it has been found that the transformation of lamellar graphite to finely divided temper carbon results in a more uniform structure and greater strength. Certain of the qualities of malleable iron are not desirable in machine castings, but the changes in structure which result in greater strength are valuable.

The aim of modern metallurgists has been to produce gray iron castings in which the graphite is fine grained and uniformly distributed, without decreasing the hardness too much and without increasing the elongation. Such castings have high tensile and transverse strength, high elasticity, and are readily machinable. They also show an increased resistance to impact and wear, and are thus applicable to use in internal combustion engines. It has been proved that all these properties are directly attributable to the uniform structure of the ground mass and the fine state of division of the graphite.

The ground mass of the metal consists, for the most part, of pearlite which is the eutectoid consisting of cementite (carbide of iron) and ferrite (pure iron), a structure which has been found to be highly desirable in steel. The graphite is, or should be, finely divided.

Has Pearlitic Structure

Ordinary gray cast iron often shows a considerable amount of pearlitic structure, but the graphite is present in large plates. Therefore, the value which the metal might have because of the pearlitic structure is modified by the unfavorable form in which the graphite appears. The ideal structure which cast iron should present consists of pearlite with a uniform distribution of finely divided graphite.

As in the case of steel, this structure can be attained in a measure by proper heat treatment of ordinary gray cast iron, but it is highly desirable to produce it directly. Many methods have been suggested. The first of these was that of Diefenthaler, by which the widely discussed Lanz iron is produced from comparatively low silicon iron melted in the standard cupola, and poured into molds which have been preheated to temperatures depending upon the thickness of the sections. In this case the pearlitic structure is produced by the slow rate of cooling in the hot mold. The graphite formation is subject to control only in the silicon content of the charge. This process is a specialized example of heat treatment.

A little later, Emmel developed his process which produces similar results from cupola metal without the use of heated molds. The silicon content of the metal is comparatively high, and the total carbon low, the latter condition being attained by the use of steel scrap in the charge. Another feature of this process is the high melting and pouring temperature, approaching in substance the later process of superheating. Such metal also attains the pearlitic structure by relatively slow cooling. Both of these processes have been described and the properties of the resulting metal compared in articles by the author in the Aug. 1 and Aug. 15, 1928 issues of THE FOUNDRY.

Development of the Lanz and Emmel processes brought about far-reaching results commercially, but more important than this is the fact that it served to arouse the interest of metallurgists and foundrymen in a material which previously had been considered to be immune to improvement.

Favors Rapid Decomposition

Simultaneously, the rather unfavorable conditions of the industry brought about by the increased use of forgings and welded parts, indicated that ways and means must be found to overcome this competition. The original work of Diefenthaler and Emmel pointed out the direction in which improvement of the quality of gray cast iron should be sought, and this stimulation led Piwowarsky, Goerens, Schuz, Hanemann, and other metallurgists to attempt to work out a theory of graphite formation which would explain the improved properties of cast iron produced by the new methods. From this theory it was hoped that still further improvement might be attained, and that costs of production might be lowered. Piwowarsky experimented extensively on the superheating of cupola iron and showed that by this process, the properties of the metal were to a large extent influenced.

His opinion was based on the theory that control of the ground mass or matrix can proceed only by lowering the total carbon or the silicon content of the metal. A high percentage of silicon or of total carbon favors rapid decomposition of the iron carbide, a fact which has been proved quantitatively by Oberhoffer and Piwowarsky, *Stahl und Eisen*, 1925. The disintegration of cementite is accelerated just below the melting point and it is in this region that the iron is graphitized effectively. Graphite and temper carbon dissolve comparatively slowly in iron. Low temperature melting and retarded setting of the metal after pouring favor a graphitized product. At higher temperatures the particles of undissolved graphite present in the melt disappear more completely, increasing amounts

Describes Other Methods

IN PREVIOUS articles which appeared in the Aug. 1 and Aug. 15 issues of THE FOUNDRY, *the author describes the Lanz and Emmel processes for producing gray iron with a pearlitic structure. In this article which will be presented in three instalments, Mr. Marbaker presents information on other methods for producing high quality cast iron. Mr. Marbaker holds the Whiting Corp. Industrial fellowship, Mellon Institute of Industrial Research, Pittsburgh.*

of iron carbide probably are formed, and the iron sets with a whiter fracture upon cooling. In the region of rapid disintegration of carbide, directly after setting, the tendency toward the growth of graphite crystals is diminished.

Iron in the molten state is capable of dissolving a certain amount of iron carbide as such, and hence need not take up much elementary carbon. When the silicon content is low, however, and any carbon is present, it is taken up much more rapidly and converted into iron carbide in an amount depending upon the equilibrium conditions. In this way the liquid phase becomes more homogeneous and when it solidifies on cooling, a more uniform relation exists between the chemical composition and the physical structure. The cooling must be slow, however, to compensate for the relatively small amount of silicon present. This is the basis of the Lanz process.

Accounts for Results

When the total carbon content is reduced the rate of iron carbide decomposition is lower. Iron carbide is quite stable in dilute solution and during melting there is not so much chance for the formation of temper carbon as when the concentration is higher. The solution of elementary carbon proceeds rapidly and the resulting melt is homogeneous, and when it cools it is not so sensitive to changes in section. Because of the higher silicon content it is not necessary to retard the cooling rate and it is possible to select charge mixtures which are suited to the rate of cooling existing under normal foundry conditions. The properties of the resulting cast iron are improved because of the reduction of the graphite content. The Emmel process is based on this theory, and the latter also accounts for the improved results obtained when large amounts of steel scrap are added to ordinary cupola charges.

Usual non-uniformity of metal and the difficulty in reproducing results in the foundry are due to the fact, it is claimed, that the iron is not heated to a sufficiently high temperature to bring about the complete solution of the carbon and to attain the degree of homogeneity of the melt which is desirable. The theory here is that when such a homogeneous melt cools, the crystallization of the graphite proceeds from tiny nuclei and the resulting crystals are small and evenly distributed. The degree of superheat determines the amount and fineness of the graphite present. On cooling from high temperatures (2700-3100 degrees Fahr.) the graphite is deposited in fine crystals of the temper carbon form, and the properties of the metal are improved greatly. The rate of cooling should be slow enough to allow the solid solutions to become saturated, and this, *Stahl und Eisen*, 1927, insures equilibrium in the finished casting.

The superheating of cast iron has been studied thoroughly by Piwowarsky and Meyer, *Stahl und Eisen*, 1927, and it has been shown to result in superior strength qualities. The superheating may be carried out in the standard cupola by decreasing the melting ratio, but care has to be taken that too much carbon is not absorbed from the coke. It is preferable to use one of the many types of forehearth which are heated independently since in this way the carbon content can be controlled. The Wuest oil-fired furnace has been used successfully because no coke is present and there is little chance for the melt to take up carbon. The electric furnace also offers great possibilities of success in the production of high test cast iron, especially when the Kerpely process of duplexing (melting the charge in the standard cupola and refining in the electric furnace) is employed. The powdered coal-fired cupola also is said to make possible the superheating of the iron without so great a risk of carbon absorption.

Perhaps the most important advance in the gray iron industry, especially in this country, has been attained by the use of larger quantities of steel scrap in cupola mixtures in the production of semisteel or synthetic cast iron. Means have been devised whereby even straight steel charges have been melted in the electric furnace and the resulting castings have shown the characteristics of high test cast iron. The theory is followed in that the total carbon is kept low and the graphite precipitated in small crystals, well distributed throughout the ground mass which exhibits the desired pearlitic structure. It is probable that the advantages gained in these processes are due to superheating because the temperatures used in melting steel mixtures are necessarily much higher than those commonly attained.

Homogeneity of the molten iron mixture before pouring which has been proved to be a major consideration by Piwowarsky, and his conclusions have been substantiated by Hanemann, is attained in a different manner in the Deschene process by subjecting the molten metal to violent jolting and agitation in a specially designed forehearth which is supplied with metal from the standard cupola. The metal thus produced is claimed to show all the characteristics of high test iron.

Sells Sand Equipment

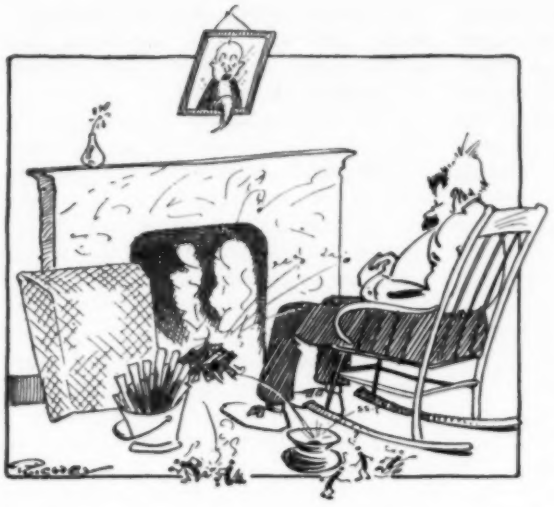
The Royer Foundry & Machine Co., Wilkes-Barre, Pa., has sold sand separators and blenders to Wm. H. Barr, Inc., Buffalo; Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, Que.; Canada Iron Foundries, Ltd., Three River, Que.; Cia Fundidora de Fierro y Acero de Monterrey, S. A. Monterrey, N. L., Mexico; Cincinnati Milling Machine Co., Cincinnati; Dominion Wheel & Fdries., Ltd., Cobourg, Ont.; Fremont Casting Co., Worcester, Mass.; Gem City Stove Co., Dayton, O.; Gisholt Machine Co., Madison, Wis.; Graff Furnace Co., Scranton, Pa.; David S. Hays & John L. Denton, New York for shipment to Brazil; International Heater Corp., Utica, N. Y.; Perfect Circle Co., New Castle, Ind.; Port Hope Sanitary Mfg. Co. Ltd., Port Hope, Ont.; Sibley Machine Co., South Bend, Ind.; Standard Automotive Parts Co., Muskegon, Mich.; Superheater Co., Ltd., Sherbrooke, Que.; Western Foundry Co., Chicago; Wright Aeronautical Corp., Paterson, N. J.

Issues Monthly Bulletin

The American Mond Nickel Co., Central building, Pittsburgh, has begun the publication of a monthly bulletin which gives information concerning technical articles and bulletins which have been published during the month dealing with the uses of nickel and its alloys. The bulletin is divided into the following departments: Nickel; electrodeposition of nickel; nonferrous nickel alloys; ferrous nickel alloys; general; patents. The first few pages of the bulletin each month are to be devoted to some special point of interest which has appeared in the technical press or has arisen as the result of the research work of the American Mond Nickel Co.

Detroit Group Meets

Members of the Detroit Foundrymen's association on Nov. 15 visited the coke ovens of the Semet-Solvay Co. and saw the casting and pouring of pig iron at the Hanna Furnace Co. as part of their plant visitation program. At the meeting which followed the members were addressed by F. J. Walls, executive member Detroit Foundrymen's association, on, "Why Foundrymen Should Belong to Our Association," by W. T. Heck, Hanna Furnace Co., on "The Manufacture of Pig Iron," and by L. A. Miller, superintendent, Detroit Coke Ovens, Semet-Solvay Co., on "Construction and Operation of By-Product Coke Ovens."



Bill Makes Plea for Better Firebars

By Pat Dwyer

ONE night recently I stretched my legs in front of an open fire and reflected luxuriously and lazily that this certainly was the life when a poor down trodden working man could sit and smoke in comfort.

After all is said and done, I thought, there is nothing like a good old fire in a grate. Personally, I prefer a nice, soft, gassy coal fire, but on this occasion the grate was filled with wood. I am not one to deny the merits of wood, but it requires too much attention. Also, it presents one serious drawback. The hunks of wood keep popping in the most disconcerting manner and unless the front of the fireplace is guarded by a wire screen, live coals jump out and burn holes in the rug.

I happened to doze for a moment, for mind you, an open fire is conducive to dreaming. A huge spark, with that species of fiendish cunning which at times seems to actuate inanimate objects, flew out of the fire and landed on my slippered foot. Just for a moment I imagined I was in the foundry and some careless yahoo had upset a ladle of metal on a wet gangway. Just goes to show what early association and a guilty conscience will do for a man when he is in a semi-conscious condition.

My startled yell attracted the attention of a certain busy person who has reminded me on innumerable occasions that she never has either the time or the inclination to sit down and go to sleep in front of a fire. Instead of extending a proper measure of sympathy—for all she knew to the contrary I might have lost the foot—she stated in the most callous manner, it served me right. I should have had more sense than to sit so close to the fire and if I left the screen where she had put it, instead of moving it to spit in the fire I would not get burned. Long experience has taught me the utter futility of advancing the most careful and logical arguments in support of any contention. I could have pointed out that if we had a coal fire the accident could not have happened. If I had made this statement I am morally certain she would claim I was just too lazy to chop the wood and that would leave me, as you might say, high and dry on a limb.

Fortunately at this juncture Bill drifted in and I asked him if he ever had devoted any thought to the development of a grate that would be both safe and sane.

"Well," said Bill, "I'll tell you. The manufacture of that kind of grate is on a fairly satisfactory basis, but I know of another class of castings that requires attention. There is nothing fancy or wonderful about these castings and I don't believe they ever get their names in the papers. Practically every other casting has been discussed and has been the subject of learned and voluminous papers presented before foundry and engineering associations. These castings I am talking about are exposed in service to the most severe conditions of wear and temperature and yet so far as I know, no special committee has been appointed to look them over and I don't think any private investigator has tried to raise the status of this lowly casting to the position to which it is entitled. It is the tail end of the procession, the rag-tag and bobtail, the remnants, the left overs, the Cinderella of the casting family, the—"

"Maybe it is," I said, "and then again maybe it isn't. Do you think I am a mind reader? How do you expect me to venture an opinion, or even listen intelligently unless you tell me what you are talking about? What is the rag-tag and bobtail and so forth and the Cinderella of the casting family?"

"Gratebars," Bill replied in a disgusted tone. "Firebars, the things that are stuck under a boiler to support the coal while it is burning. One of the most important features in any steam making plant and yet one that does not receive half the care and attention bestowed on the fire doors, the floor plates or even the smoke stack. In the marine field they attract even less care and attention than they do on land installations. While a steamer is building, the strictest inspection service is maintained and practically all materials must conform to rigid specifications. Usually she is finished and almost ready for a final trip before some person maybe the third or fourth engineer discovers by the merest accident that no grate bars have been placed under the boilers. He tells the second. The second tells the chief. The chief swears great hydraulic salt water oaths and calls on high heaven to witness that man and boy he has cruised the seven seas for 40 years and in all that time he never has seen a

OH! FOR A LIFE ON THE OCEAN WAVE

boiler properly fitted with bars, before, during or after a voyage. He never has seen a gratebar fit for anything but a weight to be tied around the neck or the feet of a deceased fireman or second engineer and if he had his way he would not wait until they were officially pronounced deceased before he anchored a couple a hundred pounds o' iron to 'em.

"Some of the bars break in the slings coming over the side. They break when they hit the iron floor of the fire room. They break when the fireman tries to jam them into place and others break under the shearing impact of a heavy steel slice bar in the clumsy and incompetent hands of a big husky brute whose only former firing experience was gained as a fly-by-night assistant to the cook in a hot dog stand. Firebars! Firebars! Firebars! They are the bane of the engineer's life. In fact the only redeeming feature of which he can think is that the discarded bars form one of his perquisites. He sells them ashore to a junk dealer or to the foundry which supplies a new lot. Even this fine old custom, in common with many others that once rendered sea life endurable, rapidly is dying under the strangulating influence of nautical red tape and modern book keeping efficiency. A dog's life, any way you look at it!

"Every engineer has a pet theory regarding the proper shape and size of his gratebars, also the air space between adjacent bars. Unless the bars conform to his specifications he does not see why he should be expected to show maximum results either in maintenance or efficiency. During his hours of leisure and while his precious engines temporarily are under the care of the second or third —who really should be pushing a wheelbarrow—he covers sheets of paper with the most intricate calculations of grate areas, volume of air (a) at natural draft and (b) under forced draft, combinations of oxygen and carbon and the number of B.t.u.'s in (1) good Welsh steam coal and (2) the miserable rubbish with which the miserly owners have filled his bunkers. He sets down the shapes of all the bars he ever has seen and then draws a highly finished sketch of one which he is positive will show maximum life, increased steaming efficiency and ease of replacement. Periodically he submits his ideas and design to the proper authorities and periodically he is turned down. Yeah! A dog's life. No appreciation of a man of genius among the low swabs.

"He'd like to take one of these here now flossy young birds from the drawing office and stick him down in the firehold for a couple of hours. Strip him to the waist, give him a scoop and a slice bar, a pile of slate and rubbish and make him try to keep her popping with the main pipe leaking like a sieve, with steam whistling through every gasket and with the bleedin' old tub loaded to the Plimsol mark, bucking a head sea. Bah! What do these cuckoos ashore know about the proper design and functions of a

THE SHIP'S CARPENTER CAN MAKE ANYTHING

gratebar? No, not even that much!

"The foundryman receives no encouragement to supply a superior article. Usually he is not consulted on the design of the bar. He is given a set of patterns smelling evilly of bilge water and with the ends and upper edges splintered and broken from many handlings. In some instances they represent the work of a skilled patternmaker, long since dead, but the majority of the patterns have been hewed by the ship's carpenter from slabs of spruce or hemlock with the air space blocks at the ends and center fastened in place with galvanized nails clinched on the far side. They are innocent of paint or varnish. Not a single one carries a rapping plate. Any attempt to stick a draw spike in the end will cause the short and cross grain wood to split and the only way to lift them from the mold is to drag them out with a pair of pincers.

"They are dented here and there from too close communion with their iron brethren in the rolling bowels of the ship. They bear marks of hobnail shoes and charred wounds from the red hot ends of carelessly placed slice bars. They are twisted and misshapen, particularly the long, thin ones, from heat and cold and from long periods of semi-immersion in a noisome fluid, at one time presumably clean, sparkling water from the ocean's depths, hygienic and antiseptic, but now, alas, something that would puzzle old Davy Jones himself, to analyze or identify.

"Occasionally a set of patterns arrives at the foundry in good order, neatly held together with a few strands of spunyarn tied in a true square knot all ship shape and Bristol fashion. These constitute the exception, the comparatively bright spots in the foundryman's otherwise drab existence. In the majority of instances they are bound with heavy galvanized wire which leaves cruel scars. In a few instances I have seen a set of firebar patterns with a 6-inch spike driven through them fore and aft to hold them together. The engineer evidently labored under the impression that all the foundryman needed was a model at which to look while he carved the impressions in the sand or mud or whatever it is these foundrymen spill the metal into. If the name of the boat is not stamped neatly on the upper face of the pattern with individual steel letters, it is painted on the side or burned with a stencil after the manner of branding cows and other wild animals out in the great open spaces where men are men who drink likker from a bottle and milk from a can.

"The burned stencil on the side of the pattern tears the sand almost as badly as the precious painted letters, composed of some gummy material that never dries and which grips the sand in a tighter bond than ever was displayed by the two old pals David and Jonathan, or was it David and Goliath? I always get those pairs of babies mixed. Which of 'em was the stickiest?"

"I don't know," I said, "I never heard of them. I knew a little Scottish molder named Davy Bell in Brooklyn and he was—Oh! well, never mind. That was far away and long ago and you probably are talking about two other fellows. What about them?"

"Nothing," Bill replied, "Nothing at all. I just happened to think of a story I heard some place, some time about this David and some other guy always sticking around together like Mary and the little lamb or a hunk of chewing gum to the sole of your shoe. Come to think of it the chewing gum similitude is the best. The names on some of these firebar patterns are painted with tar and the way that stuff sticks to hot sand is a caution.

"Where a steamer makes regular runs between two ports the con-

scientious foundryman is inclined to supply firebars that will give maximum service. He is hindered and handicapped in this laudable desire by two main factors, price and the element of chance.

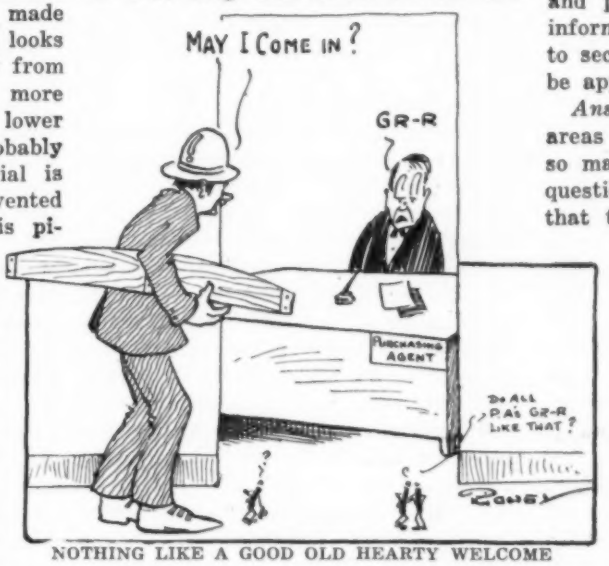
"First class pig iron and scrap cost more than junk and since the foundryman is not in business for his health he can't see his way clear to giving away—let us say—$20 a ton iron for $15. Unfortunately the buyer has not been educated to distinguish the difference between iron and iron. In his eyes, firebars simply are made from cast iron and all cast iron looks alike. He will claim, justifiably from his viewpoint, that one or more foundries have quoted him lower prices. The fact that they probably will smuggle in inferior material is dismissed airily as a fiction invented by the first man to justify his piratical intentions. With a species of uncanny and fiendish urbanity he will dig up his records to show that on a former occasion he had listened to the siren song of a foundryman who had promised to deliver a set of superior bars at an enhanced price. 'What was the result' he will inquire, leveling a pair of frosty eyes above his gold rimmed pincenez. 'We put that super set of bars in our QUEEN OF THE SAVANNAHS and they burned out in one trip! Yes, sir, begad, one little trip between Norfolk and Boston. What do you know about that?'

"The foundryman can tell him he knows a lot about it. A drunken, lazy or careless firehold crew allowed the ashes to accumulate until the bars were buried in fire above and below. Up to the present no metal has been discovered capable of maintaining its shape while immersed in incandescent fuel for a prolonged period. Argument generally only represents a waste of time. The buyer never has been in a stokehold and cannot conceive of the conditions outlined. Certainly not in one of the boats operated by a company with which he has the honor to be connected.

"Up to the present I have not heard of any person offering to do it, but I doubt if the offer would be accepted. What I mean is offer to supply a set of bars free and provide a man to stay on the job day and night to see that they are not abused. The foundryman recieves no encouragement to try any experiments of that kind and the extent of the business to any individual firm, usually is not sufficient to justify the expense.

"Alloys of gray iron containing small percentages of chromium and nickel have been developed in recent years to be used in castings exposed to high temperatures. I have not heard of any person putting an alloy of this kind in firebars and the reason, of course is that he could not find a person courageous enough to pay for them. These special mixtures have been tried out successfully in many other castings exposed to high temperatures, but for some reason owners fight shy of trying them in firebars.

"The main reason, as I said before, is that long established custom has inured engineers to the prospect of a comparatively short life in the bars and they accept this condition as one over which no person has any control. The human element and the finger of Providence enter so extensively into the lives of the men who go down to the sea in ships that they figure any old kind of a bar will last as long as one of the best.



NOTHING LIKE A GOOD OLD HEARTY WELCOME

"Competition in the foundry business is so keen and also further complicated by the presence of one or more incompetent foundrymen in practically every locality, that any man who attempts to improve casting standards must be endowed with extraordinary ability along many lines. He is a hero, my lad, who should be encouraged and imitated."

Elected Chairman

Frank N. Speller, director of the department of metallurgy and research of the National Tube Co., with head office in Pittsburgh and extensive plant and laboratory in Lorain, O., was elected chairman of the metallurgical advisory board to the Carnegie Institute of Technology and the U. S. bureau of mines at a meeting of the board in Pittsburgh, Oct. 19. Mr. Speller succeeds T. D. Lynch, metallurgist, Westinghouse Electric & Mfg. Co., Pittsburgh.

Special Care Needed on Clean Castings

Question: We are making a gray iron casting 5 x 10 inches and 3 inches thick which is causing us trouble. These castings are ground and polished and then plated. The least defective spot is enough to condemn one of these castings. We pour them from a mixture of the following analysis: Silicon 2.25 per cent, sulphur 0.03 per cent, manganese 0.85 per cent and phosphorus 0.50 per cent. Any information you can give us on how to secure perfectly clean castings will be appreciated.

Answer: One or more defective areas in a casting may be due to so many causes, that answer to your question may be summed up by saying that the only way to secure perfect castings is to pour clean iron into well made clean molds. This plain little casting you are making is apparently so simple that probably you are neglecting one or more precautions which you naturally would adopt if the casting was more intricate. The sand may be damp, hard, too fine, or the vent may be prevented from escaping readily between the lower edge of the flask and the bottom board. Any one of these factors will cause the iron to boil in the mold and create a scum and blowholes that float to the top. The remedy is to use fairly dry sand, rammed firmly, but not hard. Coarse, open sand will permit the vent to escape downward, but a fine sand must be vented with a wire. If the bottom board is not perforated, the sand on the bottom of the drag should be *scored* before the bottom board is placed in position. The comparatively heavy body of metal in this casting creates a great deal of steam in the sand underneath and provision must be made for the ready escape of this steam. A possibility exists that the runner and gate are not perfectly clean. In that case the stream of iron carries loose sand into the mold. See that the gate and runner are perfectly clean and as an added precaution in this particular instance it is advisable to pour the iron through a strainer core. The style and position of the gate are immaterial and will depend to some extent on whether the cope is squeezed on a machine or rammed by hand. For example, a small runner basin core with six ¼-inch pencil gates at one end might be placed on the pattern and rammed up with the other sand in the cope.

French Favor Standards

Members of Association Technique de Fonderie de Paris Consider Standards Covering Manufacture and Marking of Patterns

By Vincent Delport
European Manager, The Foundry

EIGHT interesting papers were presented at the seventh convention of the Association Technique de Fonderie de Paris held in Paris Oct. 26 and 27. The convention was opened on the morning of Friday, Oct. 26, in the amphitheater of the Ecole Nationale des Arts et Metiers of Paris, by M. Labbe, director of technical education, a government department. In his opening speech, Mr. Labbe emphasized the fact that science and technique have no boundaries. He also referred to the international co-operation that exists in that branch of industry through international congresses and exchange papers. He alluded to the honor recently conferred by the French government upon Paul Ropsy and J. M. Espana, who have devoted considerable time and effort to develop close relations between the founders of Belgium and Spain, their respective countries, and the foundrymen of France. Leon Thomas, president of the French association also has received the decoration of the Legion of Honor for the services that he has rendered to the industry.

Emile Ramas, honorary president of the association, read the report of the committee for the standardization of patterns. The conclusions of this report are submitted to the association and objections and suggestions will be received during a period of one year, before final recommendations will be made. This report raised a certain amount of discussion at the meeting. One of the recommendations states that when tenders are requested without any indication as to the method of molding, the designer of the pattern should indicate the method of molding. While several objections were made to this suggestion, E. V. Ronceray stressed the point that the recommendation applied only in case the method was not specified by the engineer. Some difference of opinion was expressed regarding the assembling of wooden patterns, the direction of the sweep in loam molding, finish thicknesses, and the colors that should be applied to patterns. In the latter case, Carlo Vanzetti said that only America and Germany have standardized colors, and he suggested that the American scheme is the most advisable and might be adopted as an international standard.

Oscar Querut, patternmaker at La Louviere, Belgium, followed this report with a paper entitled "Progress in Standardization." This was an exchange paper of the Association Technique de Fonderie de Belgique. The author insisted on the necessity of establishing a definite program of work before starting any operations on a given casting. E. V. Ronceray, said that this paper concurred with the general program of standardization that will be developed by the association.

In the afternoon, the exchange paper of the Institute of British Foundrymen, entitled "Heat Treatment and Volume Changes of Cast Iron Between 15 and 600 degrees Cent.," by J. W. Donaldson, Scott's Shipbuilding & Engineering Co., Ltd., Greenock, Scotland, was presented by Vincent Delport.

M. Ronceray read a note sent by F. Renaud, of the School of Foundry, who translated the paper. M. Renaud expressed the hope that the author of the paper would conduct a series of tests based on variations of sulphur content. He cited H. A. Schwartz, who has said that sulphur retards graphitization. Furthermore, M. Renaud noted that sulphur maintains the carbon as combined carbon and increases the thickness of the chill effect.

M. Ronceray drew attention to the resistance of cast iron at high temperatures above those discussed by the author. He said that changes in the composition do not appear to have the influence on resistance at high temperatures that one was led to believe. This is in apparent contradiction to the matrix theory. According to the paper it seems that the primary graphite has the greater influence. Professoe Rabozee, of Belgium stated that at these temperatures it seems that graphitization increases, but in high duty cast iron it increases in the form of lamellae, whereas in malleable iron it increases in the form of nodules.

Mr. Le Thomas, manager of Fonderies Piat, has made investigations on cast iron for diesel engines and turbines. His experiments were based on the use of the dilatometer of Chenard and Portevin. He said that up to about 500 degrees, the phenomena are reversible, but at a critical point the growth is immediate. At from 700 to 900 degrees Cent. the phenomena are much more complicated and there are additional anomalies.

Mr. Ronceray emphasized the importance of the dilatometer for tests of this kind, this apparatus giving, not only final results, but at least a qualitative analysis as well. Mr. Le Thomas said that in the case of cementite it even gives quantitative analysis. J. Varlet, foundry manager of Societe Esperance-Longdoz, Belgium, expressed surprise at the high resistance shown in one of the tables for a high content of silicon. E. V. Ronceray replied that tensile tests cannot be considered as precise. Referring to the soundness of test pieces, Mr. Ronceray said that according to American practice, from 40 to 60 per cent of test pieces are found to be unsound and Professor Pisek also has found numerous defective test pieces. This confirms the opinion that the results given by test pieces that are not taken from the casting are not conclusive. Professor Fournel, of the Ecole Nationale des Arts et Metiers, pointed that no apparent proof is given in the paper of the oxidation of the silicon. It would be essential if such an oxidation could be made visible in the microscope. Mr. Le Thomas replied that this oxidation can be appreciated by the disappearance of lamellae of graphite, and by a modification of the aspect of the regions that surround the graphite. Mr. Blanc said that the oxide shows gray on the micrograph. Referring to the influence of sulphur, P. Ropsy said that in certain cases, sulphur is added to increase the hardness. Mr. Le Thomas added that up to 0.15 per cent the sulphur becomes manganese sul-

phide, and is invisible in the microscope.

Ing. Possenti presented a paper "Centrifugation of Cast Iron," of which he is the joint author with Signor Scorza. They are both of the Pesaro foundries, Italy. The paper describes a method of making pipe centrifugally in green sand. A description of the method was given in THE FOUNDRY, Oct. 15. Mr. Mathieu said that centrifugal castings have been made successfully in sand, in France, during the past two years. Both chilled and sand cast pipes have their qualities, but the chilled cast pipes must be heat treated. Mr. Cocqueugnot, of the Arbed, expressed the opinion that the examples of chilled centrifugal castings described in the paper showed unsatisfactory results because they had been submitted to a defective heat treatment. Other examples would give better results. The last paper presented at the session was the exchange paper of the Tcheque association. The author, M. Mitinski, professor at the School of Mines of Pibram, chose for his subject "Eutectic Cast Iron."

Discuss Malleable Cast Iron

The exchange paper of the American Foundrymen's association entitled "Some Theories of Graphitization," by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, was the first to be presented at the opening session of Saturday, Oct. 27. The paper was presented by R. Gailly of Gailly Freres, malleable founders, Charleville, Ardennes. In the discussion Mr. Gailly pointed to several useful suggestions of practical interest in the paper, where indications are given concerning the elements which do or do not favor graphitization. Opinion was divided regarding the best atmosphere to be obtained in the furnace. Mr. Gailly does not think that the atmosphere has as great an influence as is generally believed. He is of the opinion that the packing is more important, from the standpoint of heat conductivity. Mr. Lemoine, professor at the School of Foundry, referring to the triplex process, said that the converter serves to decrease the manganese contents at a relatively small cost. The elimination may be obtained in a basic electric furnace, but the operation is delicate. Leon Thomas suggested that the converter is used more as a mixer. Ing. Vanzetti and E. V. Ronceray mentioned the process used at Saginaw, Mich., where the electric furnace has an acid lining. A suggestion was made by another speaker that the Kranz process was originally used with the object of obtaining the correct carbon content, and that the sulphur factor is secondary.

Marcel Remy, Herstal, Belgium, said that tempering the metal before reheating has considerable influence on the graphitization. He emphasized the fact that the author of the paper was discussing American malleable and American practice, which are different from European conditions. He said that the strength of the metal is greater on the outside of the casting than in the mass, and he believes that it is advisable to decarburize, contrary to the opinion of the author. The European foundrymen must find the factors influencing the carbon content of the eutectic. He also referred to the methods of testing used in America, where the test piece is not taken from the casting. Mr. Gailly said that in France there is no standard test piece for malleable iron.

The next paper, by Jacques Diemer, Acieries d'Outreau, France, was "Surface Cleaning of Steel Castings." This paper deals principally with the action of the sand on the skin of the casting. J. Varlet mentioned the influence of the speed at which the metal is poured. He also said that molders often damp the sides of their molds which creates three distinct zones: One hard zone on the outside, followed by a soft zone, which itself is followed by another hard zone. There is an accumulation of gas in the soft zone. Andre Miroux, founder at Ferriere-la-Grande, read a paper "Tests for the Utilization of Agglomerated Siliceous Sands for Cores in Bronze Castings." In the discussion that followed, stress was laid on the fluidity of the metal, but E. V. Ronceray pointed out that the tests were made especially from the point of view of superficial tension. By adding a small percentage of aluminum to the bath, there is no more absorption by the cores.

"Internal Stresses" was the subject of a paper by A. Le Thomas. In the discussion it was admitted generally that the responsibility when a casting breaks or becomes defective rests with the foundry if the order was accepted without reservations. It was said that in certain cases, where experts were called to fix the responsibility, the experts would not commit themselves. It was admitted that there are some cases when it is practically impossible to foresee failure. If a rupture has taken place in one casting, then the founder should ask for a modification in the design. Ivan Lamoureux said that the method of pouring has an influence and should be studied especially. The author of the paper and Mr. Proyart, of the Cockerill foundries suggested that reheating can remedy such cases, but the customer must be prepared to pay the extra cost. Mr. Girardet said that reheating not always is practicable, but vibrating can do away with internal stresses. However, it was generally admitted that castings presenting difficulties of the kind discussed are never priced at their proper value, and that the customer should be prepared to pay more for them.

The meeting ended with the report of the committee for the scientific and experimental study of sands, presented by H. Magdalenat, chairman of the committee, and R. P. Lemoine, rapporteur. This report reviews the work done by the committee, and gives the results of many experiments. It can be obtained from the Association Technique de Fonderie.

Book Review

Protective Metallic Coatings, by Henry S. Rawdon, 277 pages, cloth, 6 x 9 inches, published by the Chemical Catalog Co. Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $5.50. In London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, for 27s 6d.

Corrosion of metals causes an enormous loss each year, and to prevent this waste many different types of metallic coatings are used. While the author does not pretend to make this book serve as a shop manual on coating processes, he does give the essentials of the various methods. Also the author includes a discussion of the characteristics and properties of the various metallic coatings which determine the usefulness of the coatings and their limitations. The first section of the book is devoted to a discussion of the principles of the methods generally employed and the second section described the methods of producing commercial coatings. The last chapter in the book is devoted to the different methods of testing the coatings and this is followed by a bibliography arranged according to the coating metal.

Hold Boston Meeting

The regular November meeting of the New England Foundrymen's association was held at the Exchange club, Boston, Nov. 14. The speakers of the evening were Messrs. Brooke and Mills, William Swindell & Bros., Pittsburgh, who spoke of the new development in electric smelting and electric annealing and heat treating in the foundry.

National Founders Meet

Discuss Code of Ethics, Business Prosperity, Depreciation, Selling and Other Problems at Two Day Meeting. T. S. Hammond Elected President of Association at Final Session

THE National Founders association at its annual meeting held in the Hotel Astor, New York, Nov. 21 and 22, elected T. S. Hammond, president of the Whiting Corp., Harvey, Ill., president of the association, succeeding William H. Barr, Buffalo, who has held that office for a number of years. D. F. O'Brien, A. P. Smith Mfg. Co., East Orange, N. J., was elected vice president succeeding C. S. Koch, Fort Pitt Steel Casting Co., McKeesport, Pa. J. M. Taylor, 29 South LaSalle street, Chicago, was re-elected secretary and the Chicago Trust Co., Chicago, will continue as treasurer.

Charles F. Abbott, executive secretary of the American Institute of Steel Construction, urged the adoption of a new code of business ethics at the Wednesday session. In speaking of the general reformation in present day sales methods, he stated that there were three distinct classes of sellers: The volume minded seller, the price cutting minded seller and the creative minded seller. He spent considerable time pointing to the foolishness of the volume minded seller. The American idea that mass production is the secret of success in business, must be modified. Mr. Abbott pointed out that all too many business men have not learned that a million multiplied by zero still gives zero. Without provisions for a reasonable profit, business operations are futile.

The price cutting minded seller was criticized severely. The speaker pointed out that that type of business man was a parasite living on the efforts of other manufacturers. In conclusion he stated that the small group of creative minded sellers, who are realizing a reasonable profit with reasonable production, are introducing merchandising ideas which are tending to stabilize American business. This small group of sellers is leading the country into better things in a business way.

Present prosperity in America is a state of mind more than a fact susceptible of demonstration, according to Virgil Jordan, chief economist of the National Industrial Conference board. The speaker believed that the solution of the problem now facing industry will be found by balancing production and consumption by expansion of consumer's purchasing power to keep step with production.

"Automatic Blast Gate Control for Cupolas" was the subject of a paper presented by H. V. Crawford, the General Electric Co., Schenectady, N. Y. At the same session John L. Carter, Barlow Foundry, Newark, N. J., reported for the committee on foundry costs and led the discussion on that subject. John Alden Grimes, the treasury department, Washington, urged the association to make depreciation studies in co-operation with the internal revenue department. James A. Emery, counsel for the National Founders association, spoke of several legislative measures which will be considered at the next session of Congress.

A round table breakfast was held on Thursday morning and the problems of selling foundry products were discussed. C. H. Hoffstetter, Odin Stove Mfg. Co., Erie, Pa., led the discussion. At the final session L. W. Olson, Ohio Brass Co., Mansfield, O., and L. A. Hartley, director of industrial education, National Founders association, discussed industrial training. "Melting Practice" was the subject of a paper presented by H. M. Lane, Detroit.

The convention dinner was held Wednesday evening.

Oil Core Sands Stick to Cast Iron Dryer

Question: Our radiator cores are bonded with linseed oil and dried in cast iron drier shells. The sand sticks to these shells and we have considerable trouble in cleaning them. Do you know of any material that would assist us in cleaning these shells easily.

Answer: The tendency of sand to stick to the driers can be prevented to a considerable extent by adjusting the amount of oil and water in the sand. You probably are using too much oil. However, even with the best of care, a coating of sand will accumulate at times on the faces of the core drying shells and various methods have been tried to clean them. In one prominent automobile foundry they are sandblasted. In another the shells are loaded in the tumbling barrels with the castings. In still other places a pickling solution is employed to clean metal coreboxes and shells that have been encrusted with sand. A solution is made up of 10 parts of water to 1 part hydrofluoric acid (30 per cent) and the coreboxes and driers are allowed to soak in it for several hours, usually over night. Then they are washed with clean water and rubbed with kerosene or gasoline. For quick action a small amount of muriatic acid, 10 per cent, is added to the solution which is used warm, but not hot. The operator using this solution must wear rubber gloves and otherwise protect himself. Several proprietary materials now are on the market for cleaning sand from the surface of castings. You can secure complete particulars from your nearest foundry supply house regarding these materials.

To Enlarge Foundry

Frank Foundries Corp., with plants at Moline, Ill., and Davenport, Iowa, will erect two buildings at the Moline plant, one 100 x 160 feet to house the foundry and the other 70 x 100 feet will be used as a shipping room. The proposed construction is a part of a five-year program for expansion prepared for the corporation by A. A. Wickland & Co., consulting engineers, Chicago. A three-story brick building on the land recently purchased for the new development will be remodeled and used as a maintenance department. It is understood that within a few years another foundry and molding building is to be erected, and a second structure to be used as a cleaning department.

Accepts New Position

William F. Hunsche, formerly secretary, Buckeye Products Co., Cincinnati, now is associated with the Goehringer Foundry Supply Co., Cincinnati, as secretary-treasurer.

Cleaning Room Progress Aids Production of Quality Castings

By Frank G. Steinebach

Part XVI

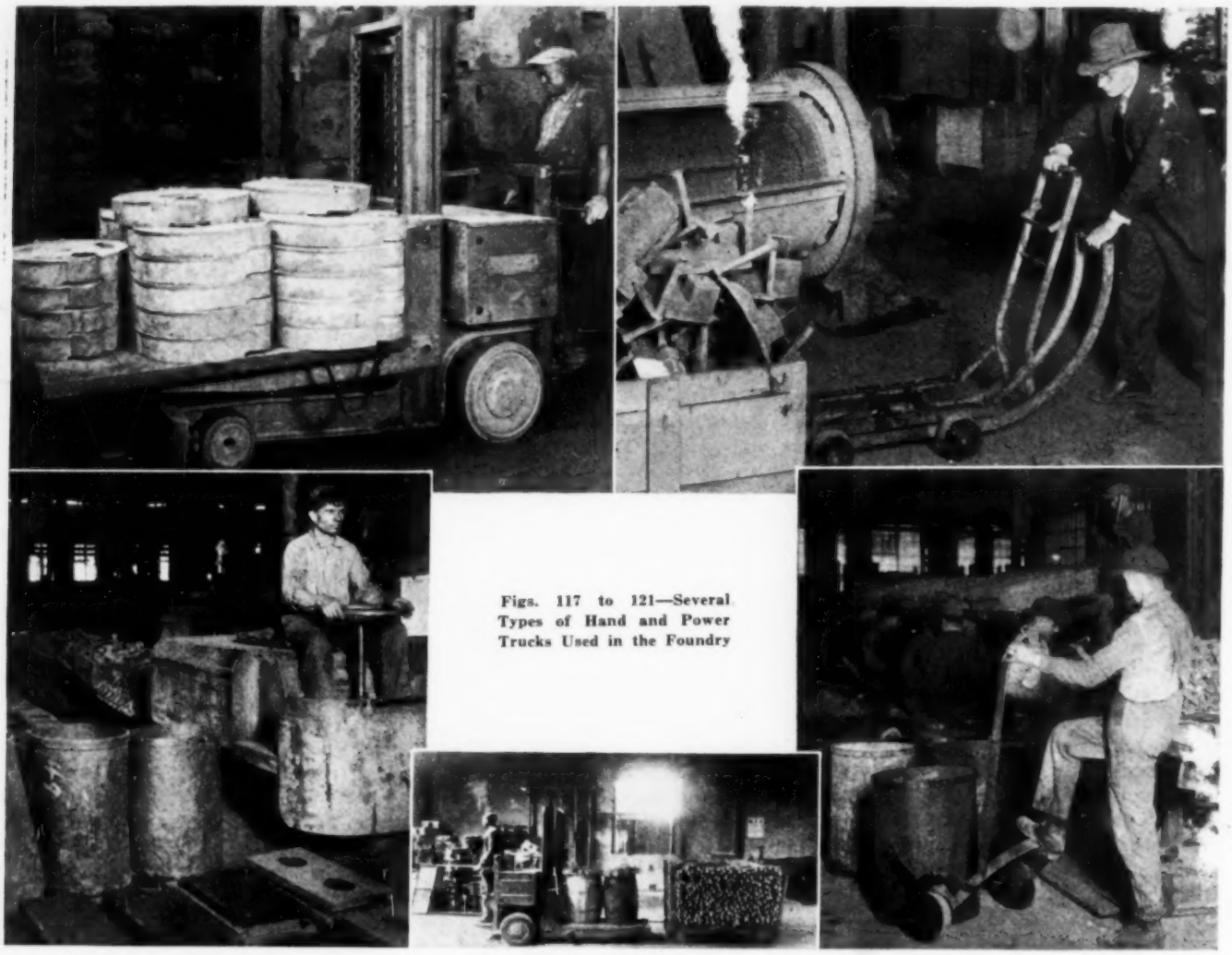
MANY foundries, especially production shops, are utilizing various types of conveyors in the solution of plant material handling problems. Conveyors, which are employed in practically all parts of the foundry including the cleaning room, may be divided into two general classes, namely gravity and power. Gravity conveyors include sheet metal chutes and roller conveyors. The sheet metal chute is built either straight or in a spiral, depending upon the distance and direction of travel and the size, weight and nature of the commodity to be handled.

The roller conveyor may be used in numerous ways in the foundry cleaning room. This type of unit often is employed to carry the castings directly from the shakeout to the tumbling barrels or the sand blast as shown in Fig. 116. Where the roller conveyor is used in connection with sandblast rooms, it is practical to have a continuous conveyor line running through the sandblast area. While the conveyor is subjected to the action of the blast, and its life therefore would be much shorter than that of a conveyor outside of the sandblast room, it is not necessary for the operator to enter the room and therefore blasting may be continuous. The conveyor also may be used to carry castings to the chippers and grinders as in Fig. 115, and in some foundries the chipping and grinding operations are performed by portable grinders while the castings rest on the conveyor line. Another conveyor line may carry the castings from the cleaning room to the shipping department of the machine shop.

Roller conveyors are built in sections and each section is equipped with couplings. One manufacturer makes the straight sections in standard lengths of 4 and 8 feet for the 1⅝, 1⅞, 2¼-inch diameter rollers and in 6-foot lengths for 2⅞ and 3¼-inch diameter rollers, when using flat bar frame rails. With angle iron frame rails the standard length sections are 5 and 10 feet. Curved sections usually are made on the specifications of the customer.

A two rail roller conveyor consists of a single row of rollers assembled between the flat bar or angle iron frame rails, as in Fig. 115, while the three rail roller conveyor has a double row of rollers assembled in a three rail frame. In both types the frame rails are held rigidly by braces. Usually rollers are made of heavy steel tubing or cast iron. The roller is mounted on full length axles which run through roller bearings at each end. The shaft or axle is mounted securely to the conveyor frame, various methods being used to accomplished this purpose. Since, in the foundry and other industries, the conveyor must operate in an atmosphere containing considerable dust, guards are provided to protect the bearings. Various methods of supporting the conveyor line are employed. The support usually is a structural steel frame designed to carry the conveyor unit and the moving load. One manu-

FIG. 115-116—ROLLER CONVEYORS ARE USED IN MANY FOUNDRIES TO TRANSPORT CASTINGS FROM THE SHAKEOUT TO THE VARIOUS DEPARTMENTS OF THE CLEANING ROOM



Figs. 117 to 121—Several Types of Hand and Power Trucks Used in the Foundry

facturer recommends that where the unit is to be elevated 6 feet or less, floor supports be used. If the unit is to be mounted higher than 6 feet, the conveyor should be supported from the ceiling beams.

While numerous types of power conveyors are in use in various industries, only a few are applicable to the foundry cleaning room. These include aprons, belts and carriers. The apron conveyor is made up of steel or wood slats which are carried on two strands of chain and form a continuous table upon which the load rests. The chains usually are equipped with rollers which run on steel guides or steel rails. The apron conveyor is designed for severe service. For that reason it may be used to handle hot castings from the shakeout to the cleaning department and for other severe work. Although the belt conveyor is used rather extensively in the foundry to handle sand, its use in the cleaning room is limited. The belt conveyor is made of an endless belt, usually rubber, operating over pulleys and idlers.

The carrier type conveyor usually consists of two steel rails supported at the desired distance from the floor. These steel rails in turn support a carrier, which may be mounted on wheels or may slide along the top of the rails. The carriers in the system are attached to an endless chain operating over pulleys located at the ends of the system or at any turns. Castings, or any other object to be moved, may be placed on the carrier and transported to any desired point along the conveyor line. This type of conveyor probably is used to a greater extent in the molding department to carry the molds from the machines to the shakeout, than in the cleaning room.

Trucks are used extensively to handle materials in the foundry. They are employed in the cleaning department to transport the castings from the shakeout station or the molding floor to the sandblast, tumbling barrel or other cleaning equipment and from there to the shipping department or the machine shop. In a general way, industrial trucks may be classified under three headings, namely; hand trucks, which include carts and wheelbarrows; power driven trucks; and tractors and trailers. A number of factors must be considered before deciding which type of truck should be employed. These include the strength of the floor over which the trucks must pass, the grades, length of haul, material to be transported, width of aisles, etc.

Hand trucks usually are adopted where materials are to be transported short distances and where other conditions are such that it is possible for the operator to move the load without difficulty. A wide variety of trucks and other hand equipment is in use, ranging from the plain platform truck with four wheels to the hand operated lift truck used to move platforms or tote boxes from place to place.

The wheelbarrow, another type of hand truck, probably was the first material handling equipment employed in the foundry cleaning room and today occupies a prominent place. Foundry wheelbarrows are built with steel trays mounted on either steel or wood handles, steel handles probably predominating. The tray may be bolted directly to the handles, or it may be bolted to a second bottom, as in the chassis type of construction, where one tray may be removed and another attached without disassembling the remainder of the barrow.

Sturdiness is a necessary quality in wheelbarrows for foundry work.

One type of lift truck which handles small barrels is shown in Fig. 121. Another hand truck, which is of the simple lift type, is shown in Fig. 120. As may be noted in the illustration, the backward movement of the front handle raises the steel skids sufficiently to lift the box from the floor. In another type of hand lift truck, the platform is raised by a downward movement of the truck handle. When the platform has been raised, it is held in place by a locking frame which engages in a lifting bar ratchet. Pressure on a foot pedal unlocks the toggle and throws the weight of the load on a vertical release check. This check in some types works on the principal of oil compression and permits the load to descend smoothly and slowly. Trucks of this type are built with lifting capacities up to 10,000 pounds.

In recent years industrial trucks have been used rather extensively in the foundry. Two types of power trucks are used, namely the electric storage battery truck, shown in Fig. 119, and the gasoline engine truck illustrated in Fig. 118. Variations in the construction of trucks permit the transportation of materials on the truck platform or upon platforms, skids, etc., which are picked up by the elevating platform of the truck. The platform type truck is built in numerous sizes with a maximum capacity in the neighborhood of 2 tons. The high, platform-type truck built by one manufacturer has large wheels and spring suspension to permit operation over rough surfaces. The truck platform is 25½ inches above the floor and the platform contains 22 square feet of space. The truck may be turned with a radius of 1 inches on the outside of the truck and 42 inches on the inside of the truck. Several companies also build a low platform truck which has a platform only a few inches from the ground.

The lift truck, of which there are two general types, are used considerably in the cleaning room. One type, the elevating platform truck, is constructed with the elevating end of the truck built low, as in the low platform type. This truck is manufactured in different sizes and with the elevating platform at various heights from the floor. One manufacturer builds the platform from a single plate with the edges bent into a deep skirt along the sides and the forward end. The joints and reinforcing bars are welded and a heavy cross bumper is riveted. Three heavy steel castings riveted to the bottom of the platform hold three links, the center one being connected to the lift power unit. A lift motor is connected through a screw ram and a head pin to the heavy casting riveted to the frame. When the motor revolves in one direction, the ram is drawn back into the lift screw nut and the platform with the load is moved upward. Reversing the direction of rotation of the motors lowers the load.

Elevating type trucks also are built which will lift the loads to much greater heights than the lift trucks. Some elevating trucks have a lifting range in the neighborhood of 100 inches. As an example of how this type of truck may be employed, one foundry uses three trucks and six specially built dump bodies mounted on skids to handle the castings through the cleaning department. Castings are loaded in the dump body, which is picked up by the elevating truck and carried to the tumbling barrel. The truck is elevated and the load is dumped into the barrel. The tumbling barrels are elevated sufficiently to permit the castings to be dumped by gravity on a screen of a double skid below the mill. The stars are removed by the screen and the castings fall into a dump body.

The electric and the gasoline tractor with one or more trailers are used where the layout is such that tractors and trailers may be taken through the plant without difficulty, and where long hauls are necessary. Tractors are built with either three or four wheels, the three wheel type being designed for operation in places where a short turning radius is essential. In the electric truck the battery compartment usually is built at the rear of the unit where it is readily accessible. The gasoline tractor often is built with the engine in the front and resembles a minature automobile. One manufacture places the gasoline engine in the rear. A wide variety of trailers are used in connection with the tractors.

Many different types of tote boxes, barrels, platforms, etc. are used in handling materials. The introduction of the lift truck has increased greatly the number of skid platforms used. The skid may consist of a plain platform or a box which is supported at the proper height by legs. It may be constructed of steel, wood or a combination of both. Special drop bottom boxes are made which may be used in connection with cranes and hoists and wire baskets also are used.

Several manufacturers of sandblast equipment have developed loading equipment which eliminates considerable handling of castings into and out of the barrels. One loader consists of an L shaped chute having one end which may be attached to the barrel. The short side of the L is supported by four castors, making it possible to move the cast easily. Tote boxes filled with castings are transported by lift truck, crane or monorail hoist and placed on the loader. The loader then is placed in position in front of the barrel and the lower end is raised by a hoist, allowing the castings to slide down the chute into the barrel.

Another loader consists of an open-end, tote box or a chute mounted on three wheels. One wheel at the closed end of the box is swiveled while the other two are mounted on an axle near the open end of the box. When loaded with castings the box is raised by a crane or hoist, the box being held by a chain attached to the box at two points and passing over a toggle. When the box has been raised to the proper height, a chain is pulled to release the lock on the toggle and the box tips, allowing the casting to slide into the barrel.

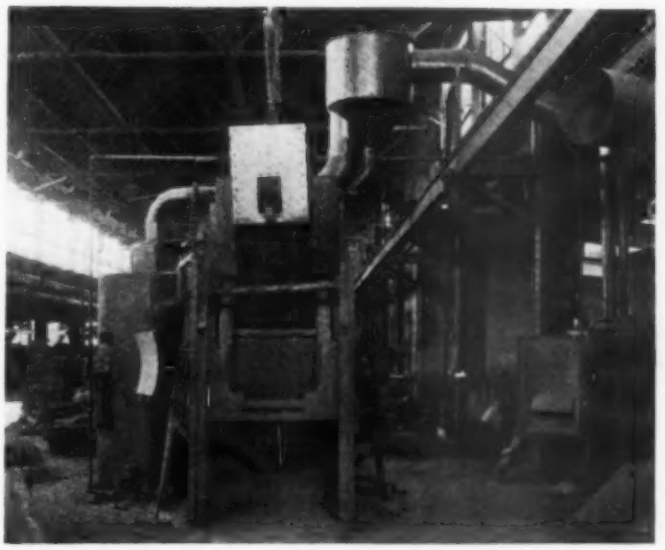


Fig. 122—One type of loading device for the barrel type sandblast machine

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶Will It Pay?

NOW and then reports are circulated that some manufacturer is contemplating a change from castings to welded parts. In some instances, such a change may reduce costs and simplify the work, but a little serious thought on the subject brings forth a number of factors that show an increase in cost rather than a reduction. Reasons for the substitution of welded steel parts for castings include ease of inventory with less space for the parts and the low cost of inventory; elimination of pattern storage and pattern development, breakage and scrap; changes in design may be simplified so that the manufacturer can change his model easily, and this will be assisted by the elimination of pattern equipment.

THESE statements appear sound on the face, but examination will reveal some flaws. In the first place there may be a slight advantage in space saved in favor of the parts for welding, but it is possible also that the shaped parts would take up more room than the finished product such as a casting. The point of low inventory cost leaves plenty of room for argument. It suffices to say that it is much easier and less costly to count one casting than it is to tabulate the assembly of parts that later will be welded into a finished structure. Patterns may be eliminated all right, but here another problem appears. Where do the shaped parts come from? Who designs and builds the forming machines, and what is the cost involved? No mention has been made as yet about forming dies that are being given away.

SIMPLICITY of making changes in design when welded parts are used, remains to be seen. However, attention is called to the fact that if any major change is made, a new forming die will be necessary, just the same as in making a new pattern for a major change in a casting. Another point not to be forgotten is that in many instances, considerable change can be made on a pattern without requiring a new one. In case of a minor change, the pattern would be favored. A new forming die would have to be made because it has to undergo strains and stresses not encountered by a pattern. Also, it undoubtedly is much cheaper to make a good pattern than it is to make a good die. The remarks on breakage and scrap may lead the uninitiated to believe that cast iron is somewhat akin to cheese, rather fragile and full of holes. No doubt some castings are defective, but they are exceptions. These exceptions can be eliminated if the manufacturer is willing to pay a fair price, and picks a reliable source for the purchase of his castings.

¶All Aboard!

PRESIDENT S. T. JOHNSTON of the American Foundrymen's association in a recent communication addressed to the membership urges as many as possible to take advantage of the special arrangements provided for attending the third international foundrymen's congress to be held in London, England, the week of June 9, 1929. A choice of two programs is presented for the convenience, time and purse of those contemplating the trip. These were mentioned in the Nov. 15 issue of THE FOUNDRY.

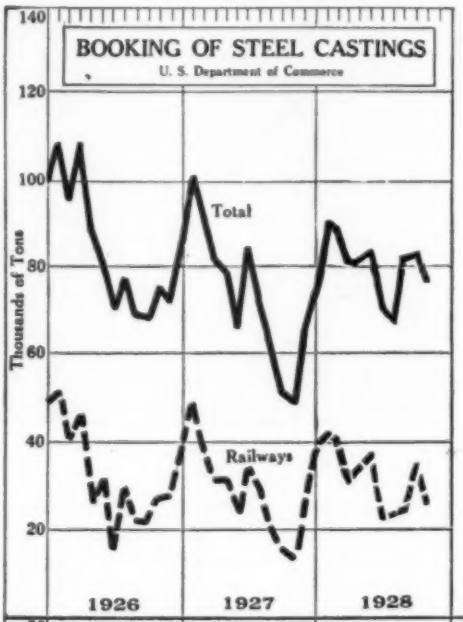
THREE post convention tours are offered for those who wish to prolong their stay in Europe and visit the continent. The first provides for a week in Paris, the second includes a two-week tour through Belgium, the Rhine country and Paris, the third extends over a period of four weeks and affords the visitor an opportunity of visiting Belgium, the Rhine, Switzerland, Italy, the Riviera and Paris. Any of the tours listed, either one of the two regular trips which include sightseeing trips through England and Scotland, or, the special extensions, should present a strong appeal to a large number of foundrymen and members of their families. Technical features connected with the congress and exhibition will compensate for the expense incurred. Mental and spiritual pleasure derived from a visit to a land so rich in storied associations as the British isles is above price.

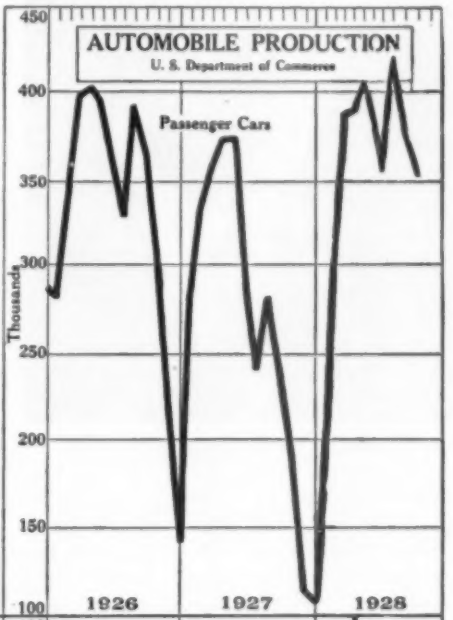
Trade Trends in Tabloid

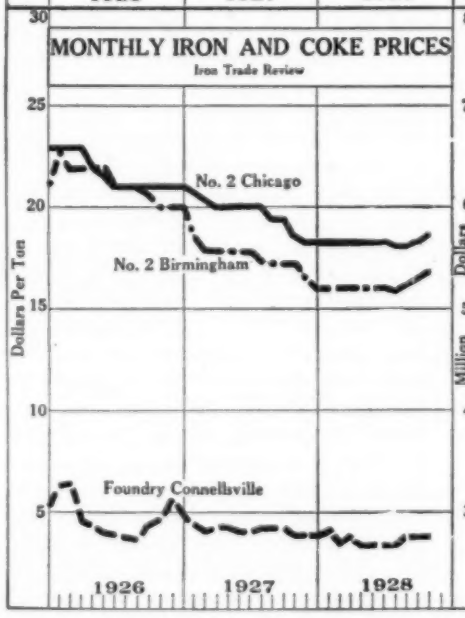
OPERATIONS in the foundry industry continue at a high rate. Foundrymen attending the recent meeting of the National Founders association in New York reported that business is good in practically all lines. The tonnage of radiators being manufactured at present is the highest in history. A Milwaukee manufacturer of conveying equipment reported business exceptionally good for this period of the year. A western electric machinery manufacturer, for the first time in a number of years, has found his own foundry capacity insufficient to meet the requirements and has been buying from jobbing interests. A midwestern electrical machinery firm is operating full time on emergency supply orders. A malleable company making electrical transmission castings and miscellaneous nonferrous parts for the electrical trade, stated that although electric railway transportation has been under a handicap, the demand for supplies and new parts is increasing. Railway buying has been slack and in consequence steel foundries lag behind others in operations. However, inquiries which have developed in recent weeks gave a more optimistic outlook in this direction. While automobile production in October dropped slightly below the output for September, the total of 354,721 cars exceeded the production in October, 1927 by 165,443 units. Pig iron sales are at about the normal rate.

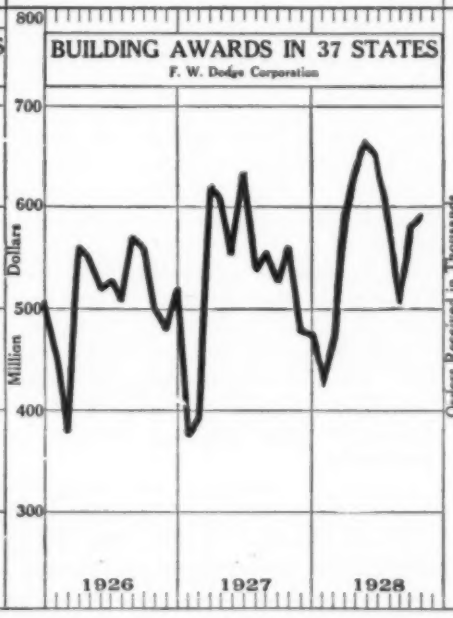
RAW MATERIAL PRICES
Nov. 22, 1928

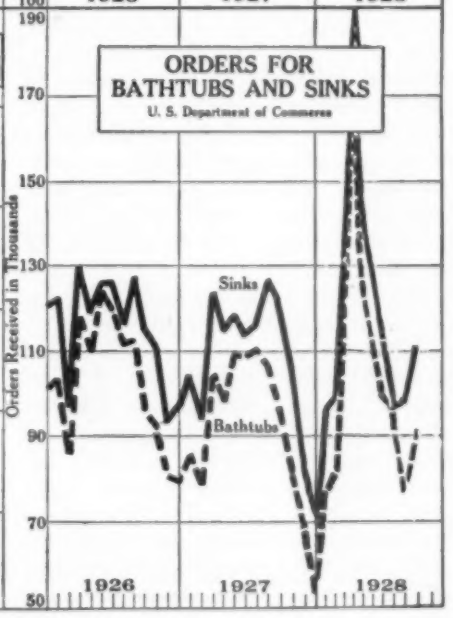
Iron	
No. 2 foundry, Valley	$18.00
No. 2 southern, Birmingham	16.50
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.26 to 21.76
No. 2 foundry, Buffalo	18.50
Basic, Valley	18.25 to 18.50
Basic, Buffalo	17.50
Malleable, Chicago	20.00
Malleable, Buffalo	19.00
Coke	
Connellsville foundry coke	$3.75 to 4.85
Wise county foundry coke	4.50 to 5.25
Scrap	
Heavy melting steel, Valley	$17.00
Heavy melting steel, Pitts.	17.00
Heavy melting steel, Chicago	14.50 to 15.00
Stove plate, Buffalo	14.50 to 15.00
Stove plate, Chicago	12.00 to 12.50
No. 1 cast, New York	13.00 to 13.50
No. 1 cast, Chicago	15.25 to 15.75
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	15.00 to 15.25
No. 1 cast, Birmingham	14.50 to 15.00
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	14.25 to 14.75
Railroad malleable, Chicago	15.75 to 16.25
Agricultural mal., Chicago	13.00 to 13.50
Malleable, Buffalo	15.50 to 16.00
Railroad malleable, Pitts.	14.00 to 14.25
Nonferrous Metals	**Cents per pound**
Casting, copper, refinery	15.50 to 15.75
Electro, copper, producers	16.00
Straits tin	51.37½
Lead, New York	6.35
Antimony, New York	10.00 to 10.12½
Nickel, electro	37.00
Aluminum, No. 12, producers	23.00
Aluminum, No. 12, remelt	16.00 to 16.50
Zinc, East St. Louis, Ill.	6.25







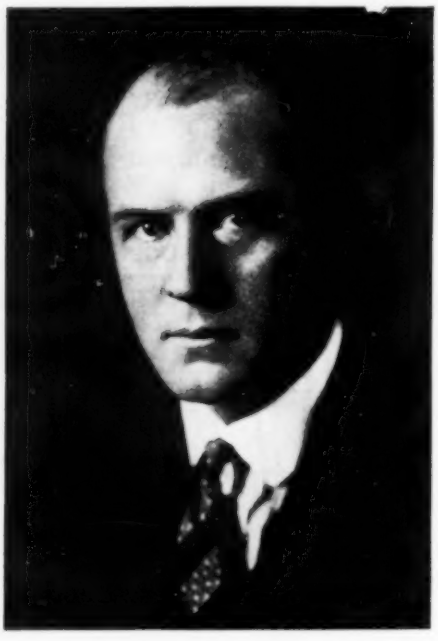




Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

COL. T. S. HAMMOND, elected president of the National Founders association at the recent meeting in New York, is president of the Whiting Corp., Harvey, Ill., and vice president of the National Engineering Co., the Swenson Evaporator Co., the Grindle Fuel Equipment Co., and the Joseph Harrington Co., all of Chicago. Mr. Hammond was born at Crown Point, N. Y., in 1884 and was educated at Hyde Park high school, Chicago, and the University of Michigan, Ann Arbor, Mich. In 1907, he entered the employment of the Whiting Foundry Equipment Co., now the Whiting Corp., serving successively as purchasing agent, assistant secretary, vice president and secretary, vice president and treasurer, and president and general manager. Mr. Hammond has been active in numerous business and technical associations. He is president of the Chicago branch of the National Metal Trades association, a director of the Illinois chamber of commerce, and has served on the executive board of the Chicago association of commerce. He has served as a director of the American Foundrymen's association, the National Founders association, and a director and president of the Foundry Equipment Manufacturers association. Mr. Hammond has been interested in military affairs and at present holds the rank of colonel in the 124th Field Artillery, 33d Division. In 1916 he served on the Mexican border and during the World war spent eighteen months overseas.



COL. T. S. HAMMOND

Dan M. Avey, editor of THE FOUNDRY, Cleveland, recently was presented with an illuminated address by the board of directors of the Gray Iron institute in appreciation of his co-operation and effort in the organization of the institute. He also was given a traveling golf bag and a set of matched golf clubs. Mr. Avey served as organizing secretary of the Gray Iron institute from its inception last year until the formal organization was completed during the summer.

Marcel Paul, managing director and chairman Hauts Fourneaux, Pont-A. Mousson, France, arrived at New York, Nov. 13 on the ILE DE FRANCE. He was accompanied by E. Roy, his technical supervisor. This French company has exported considerable cast pipe to this country since the war.

George H. Ackroyd, formerly superintendent of the Saucon roll shop of the Bethlehem Steel Corp., Bethlehem, Pa., has been appointed superintendent of the steel foundry, iron roll foundry and machine shop, at the Bethlehem plant.

E. S. Eggers, treasurer and director of the Duquesne Steel Foundry Co., Pittsburgh, has assumed active direction of the Stronach Nail Co., Ellwood City, Pa.

George R. Metcalf, president of the Erie Malleable Iron Co., Erie, Pa., has resigned. E. E. Walker has been elected to succeed Mr. Metcalf. The present officers of the company are: G. R. Metcalf, chairman of the board; E. E. Walker, president; George R. Metcalf Jr., vice president; John R. Metcalf, treasurer and A. J. Sterrett, secretary.

R. L. Cawood, president Patterson Foundry & Machine Co., East Liverpool, O., has been elected president of the Patterson Welding & Repair Co., recently organized in East Liverpool. He also is president of the American Paper Products Co. of the same city.

Calvin R. McGahey has been appointed sales engineer in charge of southern territory for the Hill Clutch Machine & Foundry Co., Cleveland. His territory includes Virginia, Tennessee, North and South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana.

John A. Marr, superintendent of the Nugent Steel Castings Co., Chicago, for the past ten years, has been appointed works manager of the Chicago Steel Foundry Co., Kedzie avenue and Thirty-seventh street, Chicago. Mr. Marr is a foundryman of 25 years' experience and formerly was employed by the American Malleable Co., Owosso, Mich., and by the Webster Mfg. Co., Tiffin, O.

JOHN A. MARR

F. Edward O'Neil has been elected vice president and manager of the diesel engine division of the Fulton Iron Works Co., St. Louis. He has been with the company since 1905 but for 11 years has been in charge of its New York office.

Charles Pack has resigned as first vice president and assistant general manager of the Doehler Die Casting Co., Batavia, N Y. Mr. Pack entered the employ of the Doehler Die Casting Co. in 1911. He organized the first chemical laboratory of the company and became chief chemist and metallurgist. In 1921 he was promoted to general production manager in charge of production in all plants. Later he was appointed assistant general manager of the company and sometime after was elected a director, secretary and finally first vice president of the company. Mr. Pack is

the inventor of many methods and processes pertaining to nonferrous metal founding and especially die-casting. Hereafter, Mr. Pack will be engaged in consulting engineering business specializing in die casting practice. His offices will be suite 2720 Woolworth building, New York.

Herman L. Pump, who formerly was identified with the Kalamazoo Stove Co., Kalamazoo, Mich., is now associated with the Ferro Enamel Supply Co., Cleveland.

Fred C. T. Daniels, formerly division superintendent of open-hearth plant No. 1, steel and roll foundries, at the Bethlehem, Pa., plant of the Bethlehem Steel Corp. has become vice president in charge of operations of the Garrison and Midland plants of the Mackintosh-Hemphill Co., Pittsburgh. Mr. Daniels returns to his first field of endeavor, having entered the employ of Mackintosh-Hemphill upon his graduation from Wooster Polytechnic institute in 1904. In 1911 Mr. Daniels became connected with the Pittsburgh Iron & Steel Foundries Co., Midland, Pa., as assistant superintendent and metallurgist, being especially interested in the development and pioneering of alloy products for the rolling mill industry. From 1914 to 1923 he was employed by the Wheeling Mold & Foundry Co., Wheeling, W. Va., and from 1923 to 1928 he was affiliated with the Bethlehem Steel Corp.

David C. Park has been elected president and treasurer of Smith & Caffrey, Inc., Syracuse, N. Y. Mr. Park entered the employ of the company as an office boy 31 years ago. George G. Heidlauff was elected vice president of that company. Mr. Heidlauff has been with the firm 34 years, first as a foundryman and for the past 20 years in charge of its ornamental iron production.

DAVID C. PARK

Frank B. Floyd, for the past 17 years structural engineer of Smith & Caffrey, Inc., has been elected secretary of that company. Mr. Floyd, previous to his employment with Smith & Caffrey, Inc., was with McClintic-Marshall Co., Pottstown, Pa., and the American Bridge Co., Elmira, N. Y.

A. S. Hawks, former chief engineer of the Busch-Sulzer Diesel Engine Co., St. Louis, has been appointed assistant works manager of the Buffalo plant of the Worthington Pump & Machinery Corp.

Samuel M. Phillips has resigned as general manager of the Stewart Furnace Co., Sharon, Pa., and has been made vice president in charge of operations of the Valley Mold & Iron Corp., Hubbard, O.

A Correction

The Institute of Metals will celebrate its twenty-first birthday at a meeting to be held in London, England, March 6, 1929, with Dr. Walter Rosenhain presiding. Through an error it was stated in the Nov. 15 issue THE FOUNDRY on page 951 that the Institute of British Foundrymen would meet on that date.

Foundry Association Directory

American Foundrymen's Association
President, S. T. JOHNSTON, S. Obermayer Co., Chicago; secretary-treasurer, C. E. HOYT, 222 West Adams street, Chicago; technical secretary, R. E. KENNEDY, 222 West Adams street, Chicago.

Associated Brass Founders of New England
President, J. A. DUNCAN, Wm. Duncan & Sons Co., 166 Liverpool street, East Boston, Mass.; Secretary, LEROY P. ROBINSON, 141 Milk street, Boston. Meeting the fourth Wednesday of each month at the Engineers' club, Boston.

The Buffalo Foundrymen
President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings on third Wednesday of the month at 146 Chandler street.

Central Illinois Foundrymen's Club
President, H. M. HIRE, Hire Foundry Co., Peoria, Ill.; secretary, FRANKLIN WHITEHEAD, The Meadows Mfg. Co., Bloomington, Ill.

Chicago Foundrymen's Club
President, DAVID G. ANDERSON, Western Electric Co.; secretary, ALBERT N. WALLIN, S. Obermayer Co., 2563 W. Eighteenth street. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association
President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
President, J. J. BOLAND, Griffin Wheel Co., Detroit; secretary, ROBERT HOPE, Holley Carburetor Co., Detroit. Meetings third Thursday in each month at Webster hall, Cass and Putnam avenues, Detroit.

East Bay Foundrymen's Association
Secretary, H. L. MARTIN, Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif.

Gray Iron Institute
President, WALTER L. SEELBACH, Forest City-Walworth Run Foundries Co., Cleveland; Secretary, ARTHUR J. TUSCANY, Terminal Tower building, Cleveland.

Malleable Iron Research Institute
President, F. L. SIVYER, Rockford-Northwestern Malleable Corp., Rockford, Ill.; secretary, ROBERT E. BELT, Union Trust building, Cleveland.

Metropolitan Brass Founders' Association
President, WILLIAM EMBER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary, WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by president.

New England Foundrymen's Association
President, CHARLES F. MILLER, Universal Winding Co., Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio Foundries Association Inc.
President, C. C. SMITH, Toledo Steel Casting Co., Bancroft and Smead avenue, Toledo, O.; secretary-manager E. F. SCOTT, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Southern Metal Trades Association
President, GEORGE B. COCKER, Gastonia, N. C.; secretary, W. E. DUNN JR., Healy building, Atlanta, Ga.

Pittsburgh Foundrymen's Association
President, W. P. BRADLEY, Wheeling Mold & Foundry Co.; secretary-treasurer WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
President, A. D. MATHESON, French & Hecht, Davenport, Iowa; secretary-treasurer, HUGO WOLF, Frank Foundries Corp., Davenport, Iowa. Meetings the third Monday of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Tri-City Technical Council
Chairman F. V. SKELLEY. Tri-City Railway Co., Rock Island, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
President, H. H. NOTT, Smith System Heating Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, south, Minneapolis. Meetings monthly at the Athletic club.

Washington Foundrymen's Club
President, RONALD KUCHER, Olympic Foundry Co., Argo Station, Seattle; secretary, EDWARD C. GUSTIN, The Prescott Co., 1 West Lander street, Seattle. Meetings second and fourth Tuesdays of each month at the Elks Temple, Fourth avenue and Spring street.

President of Machinery Company Is Dead

Fredrick Kent Copeland, president, Sullivan Machinery Co., Chicago, died at Claremont, N. H., Nov. 10, following an operation for appendicitis. Mr. Copeland was born in Lexington, Mass., and was graduated from Massachusetts Institute of Technology in 1876. After several years spent in Iowa and Colorado in mining engineering work, he helped organize the Diamond Prospecting Co. in 1884 and became its president. In 1892 that

FREDERICK K. COPELAND

company was merged with the Sullivan Machine Co., Claremont, N. H., and Mr. Copeland was made president in which capacity he served until his death. He was a member of the American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and was a past president of the Western Society of Engineers.

Obituary

Edgar H. Morgan, president Arcade Mfg. Co., Freeport, Ill., died Nov. 16, from an attack of heart trouble. He was born March 27, 1848 in Marlboro, N. Y. Mr. Morgan went to Freeport when he was 5 years old and received his education there. When he was 16 years old he entered the foundry of Jerome B. Hazen, his uncle, and learned the molders trade. Mr. Morgan was admitted to partnership in the concern in 1886. Shortly after his brother also was given an interest in the company. At the death of the uncle the Morgan brothers became owners of the business. Mr. Morgan took an active interest in the company until his death.

George E. Gage, for the past six years chief draftsman and superintendent of the Stoney Foundry Engineering & Equipment Co., 5101 Lakeside avenue, Cleveland, died Nov. 5, following an operation for appendicitis. Mr. Gage was born in Elyria, O., Sept. 4, 1896, and received his education in that city. After he graduated from high school, he became a draftsman for the Willys-Overland Co., Elyria, O. Later he became associated with the Standard Parts Co. and the Torbenson Axle Co., Cleveland, and in 1921 became a designer for the Ferro Machine & Foundry Co., Cleveland.

William A. Smith, general superintendent of the Titusville Iron Works, Titusville, Pa., died at Centerville, Pa., as a result of an automobile accident.

W. H. Shoemaker, who retired last August as superintendent in charge of erection for the Phoenix Iron Co., Phoenixville, Pa., and who since then has been consulting superintendent, died Nov. 3 at his home in Phoenixville.

John B. Murphy, aged 72, vice president of the Kohler Co., Kohler, Wis., manufacturers of plumbing goods and supplies, died Nov. 12 at his home in Chicago. Mr. Murphy was a native of Avoca, Wis., and for 20 years was associated with Kohler Co.

J. W. Oliver, first vice president of the Standard Sanitary Mfg. Co., Pittsburgh, died at his home at Sewickley Heights, Pa., Nov. 14. He was 56 years of age. He was elected a director of the Standard company in April, 1919, and the following month was elected secretary-treasurer. In January, 1924, he became vice president and chairman of the executive committee.

James H. D. Chamberlin, 92 years old, died at Springfield, Mass., Nov. 4. He founded the J. H. D. Chamberlin Mfg. Co., brass finishers and founders, in 1881 and was connected with the concern until it went out of business in 1914.

Talks to Foundrymen

R. J. Heisserman, manager, engineering and sales equipment department for foundries, Link-Belt Co., Philadelphia, addressed the Pittsburgh Foundrymen's association at the regular monthly meeting at the Fort Pitt hotel, Nov. 19. Mr. Heisserman gave an illustrated talk on installations of conveying equipment at various large foundries.

Veteran Foundry Supply Executive Dies

Van Loan Whitehead, chairman of the board of directors, Whitehead Bros. Co., Inc., Buffalo, distributors of foundry supplies, died recently in a Buffalo hospital after being struck by an automobile. Mr. Whitehead was 71 years old and had been identified with Whitehead Bros. Co. since 1877, when he entered the New York office of the company, then known as Whitehead Bros., a partnership owned by Charles, William, John and James,

VAN LOAN WHITEHEAD

sons of Samuel Whitehead, founder of the company. In 1882 he removed to Chicago and two years later returned to Buffalo. There he opened an office which has been maintained to the present. In 1892, Whitehead Bros. Co., was formed to take over the business of Whitehead Bros. and the American Facing Co. Mr. Whitehead was one of the incorporators and original directors. He served in turn as secretary, treasurer, president and chairman of the board. The Whitehead Bros. Co. is a charter member of the American Foundrymen's association and Mr. Whitehead was a representative of that company at the first convention of the association in Philadelphia in 1896.

Correction

Sam Tour, mentioned in a report of the Institute of Metals division meeting in the Nov. 1 issue of THE FOUNDRY, is consulting metallurgist, Batavia, N. Y., and is no longer connected with the Doehler Die Casting Co., Batavia, N. Y., as was stated.

Gives Use of Acetylene Welding in Foundries

In a report made at the annual meeting of the International Acetylene association in the Congress hotel, Chicago, Nov. 14-16, the oxyacetylene committee stated that during the past ten years more money probably has been spent in research on welding than on any other industry in proportion to the total investment or to the gross income of the industry.

Concerning the oxyacetylene process in foundries, the report states:

"For the purpose of clarity, the use of the oxyacetylene process in foundries will be considered as applied in the ferrous and nonferrous fields, with the major subdivisions under this general classification.

Steel—One of the most apparent developments in the steel foundries, insofar as the welding process is concerned, has been the disposition to regard it as a scientific process for accomplishing a specific piece of work, rather than a method to achieve desired results. Before the advent of the process for removing risers, and this continues to be the most important cutting application in point of volume, it was the practice to employ cold saws for the large risers and chipping tools, or sledge hammers, or a combination of the two in "flogging" the smaller risers.

"When the oxyacetylene process was adopted generally for riser removal, it was recognized as a far easier and quicker method, but the matter of cost was not given due weight and it has only been in recent years, particularly the last two or three years, that proper consideration has been accorded the economics of removing risers by the oxyacetylene process.

"Investigation commonly has revealed no accurate cost record of riser removal with resultant unwarranted waste of oxygen. Economies, effected by the standardization of gas pressures, improvement in gas distribution through oxygen manifolds and generator systems, has in some cases reduced the cost of riser cutting 50 per cent and revealed the process as one having possibilties for savings heretofore unconceived. Our efforts in this direction should be continued, so as to replace the application on the best possible competitive basis.

"Welding formerly was regarded in the reclamation of steel castings as a patching method, but the high standards now set by several research groups interested in high quality castings demand qualities in the weld the same as those in the base metal.

"Development of satisfactory rods to meet the requirements of castings analysis and colorization has been an important factor in the progress that has been registered in the salvaging of steel castings.

"Based on the present trend, it is reasonable to expect a consistent increase in the use of oxyacetylene welding in the steel foundry concurrent with the more general employment of high strength alloy castings.

Cast Iron—Use of the oxygen lance has registered in the last year in a number of foundries where large cast iron risers have been removed. Oxygen has also been employed by several foundries in opening cupola tap holes and some foundries maintain an oxygen cylinder and lance assembly in readiness for use on hard taps.

"The dissemination of information pertaining to proper methods of preheating, welding and cooling has produced uniformly successful results in the reclamation of gray iron castings, so that there is scarcely a foundry in the country operating today that is not salvaging a large percentage of its defectives.

"Salvage operations are certain to receive closer attention coincident with the demand for higher strength castings to meet the higher pressures being specified in all engineering work, and this may indicate a more general application of the process. Bronze welding is much in favor in the larger foundries for repairs to iron flasks, patterns and foundry equipment. A recent development in pipe foundries, and one which is destined to expand based on the economies of handling and laying long section of pipe, is the shear vice bronze weld for double lengthening cast iron pipe at the mill.

Nonferrous—"This group embraces principally the copper, brass, bronze and aluminum foundries. The volume of welding done by these sources is not large in the aggregate because of the common practice of remelting defectives rather than reclaiming them by welding.

"One of the rather recent notable, successful pieces of nonferrous welding was the Newark bronze war memorial monument—cast in foundries abroad and the sections assembled by welding at the permanent location.

"Large numbers of aluminum automobile crank cases and other small aluminum castings continue to be salvaged with entire satisfaction. Reclaiming surface defects on large aluminum castings has offered no insurmountable difficulties.

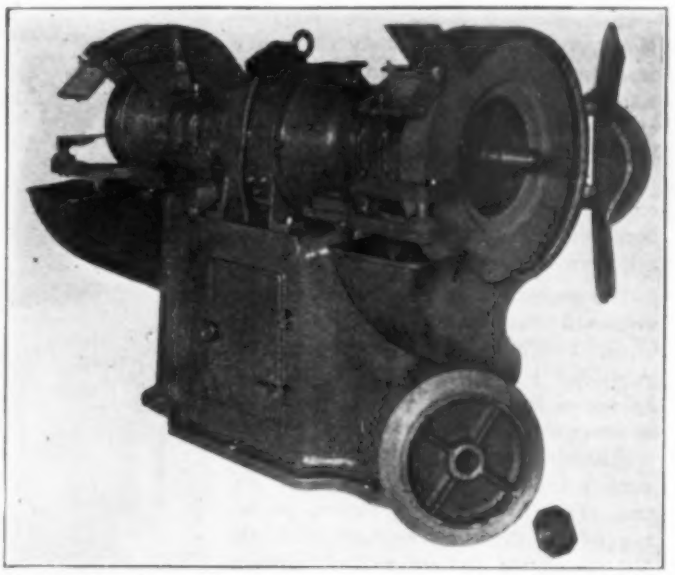
"In most cases further progress in this field awaits the development of special rods and fluxes although a considerable number of special purpose rods are meeting satisfactorily the conditions of strength, freedom from porosity, color matching, etc."

Ohio Injector Co., Wadsworth, O., has opened a branch office at 908 Daniels building, Tulsa, Okla. E. C. Powell will be in charge of southwestern territory.

Rigidity Features High Speed Grinder

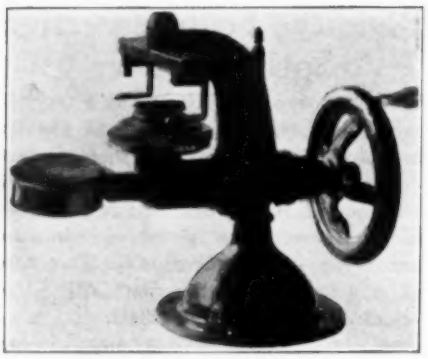
In modern cleaning room equipment, the tendency is toward rigidly constructed grinders designed to accommodate comparatively large wheels. A recent machine constructed along these lines is shown in the accompanying illustration. This tool is a product of the Standard Electrical Tool Co., Cincinnati.

The base is box-type design with offsets to afford leg room. Power is supplied by an electric motor of 5, 7½ or 10 horsepower, while the control switch is placed conveniently within the operator's reach. The machine illustrated is fitted with a 7½-horsepower motor. The grinding wheels are 24 inches in diameter, 3-inch face, 12-inch bore. Wheels are of the recessed type, the recess accommodating the wheel flange. The object of this design is to take advantage of a comparatively large arbor hole. Thus loss through wheel stubs is reduced to a minimum. Again, the use of wheels with comparatively large arbor holes permits maintaining a practically constant peripheral wheel travel without changing the arbor speed.



WHEELS OF THE RECESSED TYPE ARE USED ON THE MACHINE

The inner grinding wheel flanges are keyed to the shaft which is a 1-piece nickel steel unit. This shaft operates in four ball bearings. The grinding wheel guards are of the hinge-door type, designed to facilitate ready wheel changes. Guards are fitted with exhaust connections, spark breakers and polished wired glass eye shields. The work rests are heavy in proportion and so designed as to be readily adjustable.



PRESSURE APPLIED THROUGH THE HAND WHEEL BREAKS THE CORE

Makes Transverse Test on Sand Cores

B. F. Perkins & Son, Inc., Holyoke, Mass., recently has introduced a new transverse testing machine to determine the strength of cores. This machine is a modification of a machine used for testing paper and paper products. While the same hydraulic principle of operation is used certain alterations have been made to meet the requirements of testing sand cores.

The machine operates as follows: A standard core test specimen 1-inch wide, 1-inch thick and of the conventional length, is slipped into the holder of the machine as shown in the accompanying illustration. By turning the handwheel of the machine a pressure is brought to bear against a piston. The top of the piston is arranged so that the contact with the test specimen is on a line midway between the supports on the specimen holder and at right angles to the length of the specimen. The test, therefore, consists of supporting the specimen at two points and applying a force midway between these two points. The force required to break the specimen is recorded on a standard pressure gage of the registering type which is attached to the machine, and is expressed in pounds per square inch.

After the test, the machine may be reset quickly by pressing a button on the side of the gage and by turning the handwheel to the left as far as possible. The former operation resets the indicator hand on the pressure gage and the latter lowers the piston.

Appoints Agents

J. F. Rodgers, 726 Oliver building, Pittsburgh, and Gustavo Preston, 113 Broad street, Boston, have been appointed sales representatives for the Pennsylvania Pump & Compressor Co., Easton, Pa., in their respective cities.

Designs Molding Machine for Rapid Production

The Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, has introduced a new jolt, squeeze, stripper molding machine designed for rapid production of medium sized molds. As may be noted in the accompanying illustration, the foundation block is small and no pit is required for the machine. The squeeze cylinder is 16 inches in diameter and the jolt is the long stroke, heavy blow and valveless type. The valve handle, which controls all of the power operations except vibrating, is located in front of the machine while the valve proper is behind the machine.

THE SQUEEZE HEAD IS PULLED FORWARD WHILE THE MACHINE IS JOLTED

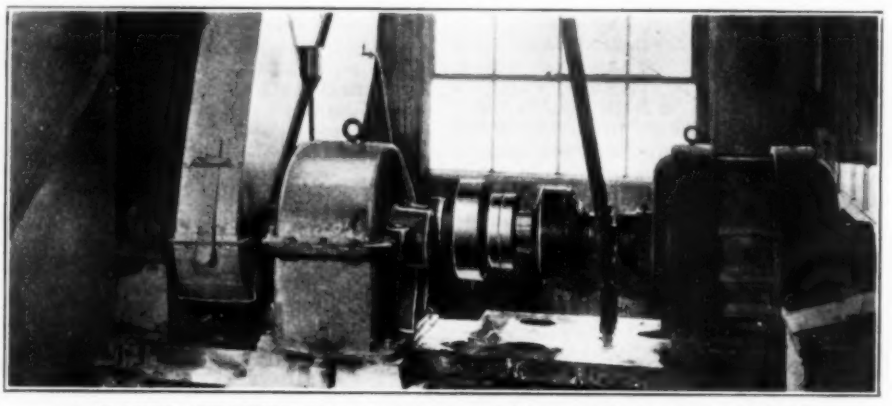
The squeeze head moves forward on ball bearing rollers on a horizontal track immediately above the jolt table. In operation, the squeeze head is pulled forward to a position over the drag while the machine is jolted. This makes it possible for the machine to go directly from the jolting to the squeezing operation without any pause. On the down stroke from the squeeze, the mold and the pattern drop a short distance. Then the mold stops while the pattern continues downward out of the sand. The lifting frame is lowered by moving the valve handle to the down position before the mold is removed from the table. The table settles to rest before the operator returns with the next empty flask.

Builds Automatic Backstop Device

The D. O. James Mfg. Co., 1120 West Monroe street, Chicago, recently has introduced a new type of automatic backstop and flexible coupling designed for elevators, conveyors and other types of drives where there is a likelihood of reversal of travel when the equipment is standing idle, when the motor has been shut off, or in case of motor failure.

The backstop is applied on the drive-shaft between the speed reducer and the motor. A flange, attached to the speed reducer housing, is cast integrally with a ratchet. This ratchet operates within the drum housing, which in turn is connected to the motor shaft through a flexible rubber bumper type coupling. Three pawls are secured by studs to the inner face of the housing. These pawls engage with the ratchet immediately after the housing stops revolving. One flange of the flexible coupling is cast integrally with the drum housing to provide compactness and strength.

Centrifugal force keeps the pawls from engaging the ratchet during operation, but if anything happens to the shaft or motor or if the power is shut off, the pawls engage the ratchet through gravity and provide a brake against reversal of travel of the machine.



A FLANGE ATTACHED TO THE SPEED REDUCER HOUSES THE BACKSTOP

What the Foundries Are Doing

Reflecting the Activities of the Gray Iron, Malleable, Steel and Brass Shops

Riverside Iron Works, Calgary, Alberta, Canada, will build a laboratory in its foundry.

Nelson Mfg. Co., 928 Chestnut street, St. Louis, plans an addition, 150 x 257 feet.

Ohio Pattern Works & Foundry Co., Cincinnati, has awarded the general contract for a 4-story and basement addition.

American Steel Foundries, East St. Louis, Ill., plans addition to its plant for manufacture of a general line of steel castings.

American Foundry & Mfg. Co., St. Louis, plans to rebuild its plant at Ninth and Wright streets, recently damaged by fire.

New Process Casting Co., Baltimore, has been incorporated by Lee H. Homand, Franklin building.

Directors of the Wanner Malleable Castings Co., Hammond, Ind., have decided to dispose of the company's plant at South Beloit, Wis.

Minnesota Threshing Machine Co., Hopkins, Minn., plans the installation of power equipment in its 1-story plant addition.

De Soto Foundry & Machine Co., Mansfield, La., is contemplating expansion of its production facilities especially in steel castings.

Pittsburgh Foundry & Machine Co., Pittsburgh, has acquired property, 48 x 460 feet, for expansion. (Noted Nov. 15.)

Atlas Foundry Co., West Sixth-ninth street, Cleveland, is completing plans for a one-story addition, 32 x 90 feet, to cost about $38,000, with equipment.

Mackintosh-Hemphill Co., Twelfth street, Pittsburgh, has asked bids on general contract for a one-story branch plant at Wooster, O., building and equipment to cost nearly $80,000.

Advance Stove Works, Evansville, Ind., which was damaged recently by fire, to the extent of $50,000, will rebuild the burned portion of the plant at once. (Noted Nov. 15.)

U. S. Cast Iron Pipe & Foundry Co., Burlington, N. J., has filed articles of incorporation in Los Angeles county preliminary to doing business in California.

McNally Tollefson Foundry Co., Stoughton, Wis., is planning to purchase the shop building it now occupies under lease and build an addition to relieve its overcrowded condition.

Jackson Street Foundry Co., Worcester, Mass., has been incorporated by Harold F. Adams, William R. O'Neill and Edna A. Berger, all of Worcester.

Landers, Frary & Clark, New Britain, Conn., has awarded the general contract for an enameling building, 100 x 123 feet, to Morton C. Tuttle Co., Boston.

Michigan Steel Castings Co., Detroit, has awarded the contract for alterations and addition to its manufacturing plant to Wisconsin Bridge & Iron Co.

Malleable Castings Co., East Columbia street, Evansville, Ind., has awarded the contract for a 1-story plant addition to M. J. Hoffman Construction Co.

Board of district commissioners, District building, Washington, received bids Nov. 15, for metal shop, wood shop and foundry equipment for McKinley high school.

Pratt & Letchworth Co., 189 Tonawanda street, Buffalo, is building a one-story addition to its power department to cost about $20,000.

City officials of Centralia, Wash., have executed a lease for 99 years granting a site to George L. Barnes, who proposes to erect a brass foundry. (Noted Nov. 15.)

M. L. Oberdorfer Brass Co., New York, has moved its show rooms into larger quarters at 149 Church street. The company formerly was located at 1 Broadway, New York.

Kalamazoo Stove Co., Kalamazoo, Mich., has announced that its business for the month of October was much better than for the same month last year.

Lanman Foundry & Machine Co., El Reno, Okla., has been incorporated with $15,000 capital by Guy Lanman, K. E. Humphrey and Herman Dittmer.

Ohio Foundry Co., 9608 Quincy avenue, Cleveland, is building a new enameling plant which will contain 30,000 square feet of floor space.

National Malleable & Steel Castings Co., Cleveland, is operating at capacity. It reports business the best in years, and its working force double that of last year.

Robertshaw Thermostat Co., Youngwood, Pa., has awarded the general contract for a 1-story foundry to the Austin Co., 16112 Euclid avenue, Cleveland.

Hanson Park Brass Foundry, 2101 North Major street, Chicago, has been incorporated with $1000 capital by John M. and Martha Micheles and Charles Schmidt to manufacture brass castings, etc.

Ferguson & Edmondson Construction Co., Pittsburgh, are negotiating for the purchase of the foundry building of the Dennison Foundry & Machine Co., Dennison, O., for storage purposes.

Doehler Die Casting Co., Smead and Prospect streets, Toledo, O., H. H. Doehler, president, has awarded the general contract for a 1-story plant addition to A. Bentley & Sons Co., 201 Belmont avenue.

General Steel Castings Co., Philadelphia, has been incorporated with $50,000 capital by J. P. Murray, 4813 Springfield avenue, Philadelphia, to manufacture, machine and treat steel castings of all kinds.

Brown & Sharpe Mfg. Co., Promenade street, Providence, R. I., has awarded the general contract for a foundry addition to Central Engineering & Construction Co., Pawtucket, R. I.

Providence Brass & Aluminum Foundry Co., 219 Aborn street, Providence, R. I., has been organized to manufacture brass, bronze and other metal castings. Arsen G. Avedisian is proprietor.

Hull Iron & Steel Foundries Ltd., Hull, Que., propose to build addition to its plant on Montcalm street. A. H. Coplan, 7 Clemor avenue, Ottawa, Ont., is general manager of this company.

Wilcox, Crittenden & Co., 3 South Main street, Middletown, Conn., is reported to have engaged Lockwood, Greene & Co., 24 Federal street, Boston, to prepare plans for a 1-story foundry to cost about $45,000 with equipment.

Lakey Foundry & Machine Co., Muskegon, Mich., is carrying out an expansion program to cost about $400,000. Additional equipment will be installed to double the present capacity.

Precision Casting Co., Syracuse, N. Y., has bought control of the P. & R. Tool Co. Inc., Worcester, Mass., maker of die castings, and will move the business to Cleveland, where it will be operated as a branch. Nathan Lester is manager of the P. & R. Tool Co. Inc.

Ervin Foundry & Mfg. Co., 1018 East Michigan street, Adrian, Mich., plans the construction of an addition to its foundry, 60 x 70 feet, and will replace buildings damaged in a recent fire. The new building will be used for a molding room and for storage space.

W. B. Wood and James M. Glenn, officers of the Central Foundry Co., Marshalltown, Ia., whose plant was destroyed by fire several months ago, head a new syndicate which plans to erect a new foundry, 110 x 125 feet, on the site of the former building.

Marshall Furnace Co., Marshall, Mich., has arranged for the purchase of plant and business of the Monitor Furnace Co., Cincinnati. The plant will be dismantled and moved to Marshall where production will be increased in the future.

What is believed to be the first consignment of malleable castings ever to be shipped by air, was recently sent to the Brown-Lipe Gear Co., Syracuse, N. Y. by the Lancaster Malleable Castings Co., Lancaster, Pa., in a little less than 2 hours.

Contracts have been awarded by the Chevrolet Motor Co., Saginaw, Mich., at its gray iron foundry here for the construction of the turning basin and dock project. Work is to be started at once. Everett Winters Co., Detroit, will build the dock and W. J. Meagher, Bay City, will do the dredging and filling.

The Club Aluminum Utensil Co., Chicago, is completing arrangements to enter the vacuum cleaner field with a machine which is to be revolutionary in design and unique in its several added features of utility, according to William A. Burnette, president of the company.

General Electric Co., Schenectady, N. Y., has spent over a million dollars within the last few months installing machinery and improving the gray iron foundry of the Erie, Pa., plant for the production of refrigerator cabinets. The officials of the plant expect to reach a 4300 per week basis soon after production begins.

Industrial Steel Castings Co., Toledo, O., will build an extention to its foundry soon. This expansion will cost about $200,000 with equipment. Some of the features of the new plant will be fire proof vaults for pattern storage, special cranes, and sand-handling equipment. A power plant to steam heat the entire industry also is contemplated.

Poor & Co., 80 East Jackson boulevard, Chicago, makers of railroad equipment and supplies, malleable castings, etc. will take over the P. & M. Co., Chicago and its subsidiary P. & M. Co., Montreal; Maintenance Equipment Co., Chicago; Vermilion Malleable Iron Co., Hoopeston, Ill.; and the Canton Forge & Axle Co., Canton, O.

Frank Foundries Corp., Moline, Ill., has purchased a strip of ground 120 x 300 feet for the construction of two new buildings which will call for an expenditure of over $100,000. This project will be directly east of the present plant. The first new building will be a foundry, a concrete and steel structure 100 x 160 feet, fireproof and modern in every respect. The second building, a 1-story, steel and concrete structure, will be used for shipping facilities.

Kimball Bros. Co., Council Bluffs, Ia., has begun the erection of a new foundry which will be equipped for the production of gray iron, semi-steel, brass, copper, and aluminum castings. The building is 50 x 90 feet and with the equipment will cost about $50,000. It will be a two-story, steel concrete and tile structure equipped with an electrically-operated, traveling crane, new molding machines, and core ovens. The melting equipment will consist of a furnace for melting

brass, copper and aluminum and a 20-ton capacity cupola for gray iron.

Bucyrus-Erie Co., South Milwaukee, Wis., will move the executive and sales offices of the Erie Steam Shovel Co., Erie, Pa., its eastern unit, from Erie to South Milwaukee at once. The Bucyrus Co. and Erie Steam Shovel Co. consolidated within the past year, but each concern continued to maintain former headquarters. These are now consolidated at South Milwaukee for greater efficiency and economy. It is not the intention to reduce production at the Erie works, which will continue as a manufacturing unit.

Ontario Malleable Iron Co. Ltd., Oshawa, Ont., has been merged with the Grinnell Co. of Canada Ltd., Toronto, a subsidiary of the General Fire Extinguisher Co., Providence, R. I. The new organization will retain the name of the Ontario Malleable Iron Co. and the same lines of manufacture will be continued and the business will be expanded. The officers of the new company are: Russell Grinnell, president; C. G. Sherman, vice president; L. W. Jones, treasurer; E. W. Shaw, secretary; W. L. Horn, managing director.

Philadelphia Nonferrous Foundry has been incorporated by Edward W. Taylor, Jr., president and S. W. Chappell, Jr., vice president. This firm has purchased the business of Sheeler-Hemsher Co. at 811 Fairmount avenue, Philadelphia. The company will manufacture brass, bronze and aluminum castings. Mr. Taylor formerly was one of the partners of the Sheeler-Hemsher Co., while Mr. Chappell was superintendent of the Bethlehem Ship Building plant at Fall River, Mass., and later was connected with the United States Metallic Packing Co.

A new corporation known as the Dunkirk Radiator Co. will erect a plant for the production of radiators and boilers in Dunkirk, N. Y., starting at once. The first factory unit will have 62,000 square feet of floor space. The executives will be men formerly associated with the Continental Heater Works which was merged two years ago with the National Radiator Co. They include Earl C. Reed, Louis N. and William C. Murray, Newell F. Gould and Howard Reed. It is reported the company has arranged a sales outlet for its product.

New Trade Publications

BEARING METALS—The Invincible Bearing Metals Corp., Sandusky, O., has issued a folder describing its products. Two photomicrographs illustrate the advantages of its metals.

ELECTRIC MOTORS—General Electric Co., Schenectady, N. Y., has issued a bulletin describing its general purpose synchronous motors in various types. It is illustrated to show details of construction.

STEEL CASTINGS—Farrell-Cheek Steel Foundry Co., Sandusky, O., has issued a number of bulletins indicating uses for one of its steel alloys designed for strength, rigidity and toughness.

GRAPHIC INSTRUMENTS—Esterline-Angus Co., Indianapolis, has issued a leaflet describing measures taken in the construction of its graphic instruments to insure satisfactory service to the purchaser.

FURNACES—The General Electric Co., Schenectady, N. Y., recently has published a booklet on heat-treating and annealing furnaces. Illustrations of the various types of furnaces are accompanied by explanations of the construction and uses of the furnaces.

AUTOMATIC TEMPERATURE CONTROL—Bristol Co., Waterbury, Conn., in a bulletin now being distributed, calls attention to methods of preventing waste by automatic control of temperatures by use of its devices. The bulletin is illustrated.

CONTRACTING EQUIPMENT—Sullivan Machinery Co., Chicago, is distributing a leaflet covering its equipment for contractors, featuring especially its air compressors. Tools to be used with the compressors are listed and illustrations show their application in service.

ELECTRIC WELDER—General Electric Co., Schenectady, N. Y., describes in a current bulletin a type of automatic welding head and control with automatic electrode-feeding device and magnetic clutch. Details of construction are shown.

SYNCHRONOUS MOTORS—Electric Machinery Mfg. Co., Minneapolis, has issued a booklet on synchronous motors. It gives the advantages of this type of motor, the theory of its operation and its development to present efficiency. Numerous applications in industry are covered.

STEEL CASTINGS—Nugent Steel Castings Co., Chicago, has issued a booklet describing the course taken by every casting leaving its foundry to insure quality and perfect condition. The description starts with arrival of the pattern, its test, through the process of making the casting and its inspection before approval.

INDUSTRIAL INSULATION—Celite Products Co., Los Angeles, has prepared a bulletin on the insulation of industrial furnaces and ovens. It is illustrated by drawings to show the method of insulation employed by various furnace designers. This includes electric and fuel-fired furnaces for heat treating work of many kinds.

STEEL CASTINGS—A bulletin by the Lebanon Steel Foundry, Lebanon, Pa., describes its technical department. Emphasis is laid on scientific control and systematic organized research. Illustrations show the various laboratories, which are described in the text. Application of laboratory results to practical uses in the foundry are outlined.

MOLDING MACHINES—The Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, has issued a folder describing and illustrating two of its molding machines. The folder contains several illustrations, two of which point out in detail the advantages of the apparatus and a layout showing one of the methods of using these machines to the best advantage.

METAL CLEANERS—E. F. Houghton & Co., Philadelphia, has issued a booklet describing its metal cleaners. The advantages of these products are discussed and general directions for their use are given. Their uses in various industries are described. Several illustrations show some of the methods used in cleaning different metal products.

MOTORS—The General Electric Co., Schenectady, N. Y., has issued a leaflet describing its two and three phase, 2 to 15-horsepower, totally enclosed crane and hoist motors. The leaflet tells of the advantages of these types of motors as well as several of the uses to which they are best suited. A table gives the specifications of the motors. Two illustrations show the assembled and disassembled motors.

PUMPS—A 28-page booklet recently has been issued by the Worthington Pump & Machinery Co., 2 Park avenue, New York, illustrating and describing its pumping equipment for buildings. The paper is illustrated with its various types of pumps and photographs of typical installations. The uses of each type of pump are described. The meters and air compressors which this company makes also are described.

KELVIN BRIDGE—Leeds & Northrup Co., 4901 Stenton avenue, Philadelphia, has issued an 8-page folder on its students' kelvin bridge. Uses and advantages are discussed and a general description is given. Advice is given concerning the selection of accessories for the circuit. A diagram showing the method of assembling the apparatus and a price list also are included. A list of Leeds & Northrup catalogs and bulletins is appended.

STEEL BUILDINGS—Blaw-Knox Co., Pittsburgh, has issued a 37-page booklet describing its line of buildings of copper-bearing, galvanized steel for industrial purposes. It gives the details of construction of the buildings, their advantages, and a list of users. Photographs of many typical installations are included. The roof sheathing that this company makes is described as are its advantages, and method of laying.

FIBER GEARS—A 32-page booklet has been issued by the General Electric Co., Schenectady, N. Y., describing its fiber gears. The method of manufacture of the gears is described in detail as are their advantages, physical specifications, and processing. The booklet is illustrated with photographs of typical installations. It also contains many tables valuable in the calculation of gear dimensions and specifications. Tables give the dimensions of the gears which this company makes.

VENTILATION—E. I. du Pont de Nemours & Co., Fairfield, Conn., has issued a booklet on auxiliary ventilation for metal mines. The booklet deals with the development, construction, sizes, qualities, uses of flexible tubing which it manufactures. It also explains ventilation systems using this tubing and how it should be maintained. The feature of the booklet is a half-section of a mine showing diagrammatically how the flexible tubing is used in mining operations.

CRANES AND TROLLEYS—H. D. Conkey & Co., Mendota, Ill., has issued a 45-page booklet on its cranes and trolleys. The advantages of these articles which they manufacture, drawings, illustrations and tables give the specifications, size, weight and cost. The booklet is illustrated adequately with drawings, illustrations and photographs of detailed and assembled machines. Photographs of many typical installations are included. Tables give the specifications, and much information about the various types of cranes this company manufactures.

METERS—Connersville Blower Co., Connersville, Ind., recently issued a 10-page folder on its meters. They are the rotary positive displacement type. The history of the development of these meters, their uses and their advantages are discussed and the various features are described. Illustrations show the meters this company makes and a table gives the capacities, size and shipping weights. The pressure-volume-temperature-time recording gage, tandem meter and demand meter are discussed. Photographs of typical installations are included.

INDUSTRIAL MACHINERY—Ideal Industrial Machinery, division of Consolidated C. M. Corp., Winton Place, Cincinnati, has issued a 31-page booklet describing and illustrating the machinery that it makes. The equipment includes tumbling barrels, separating, cleaning, washing, burnishing, pickling and painting equipment. Photographs illustrate these various types of machinery and their advantages are discussed. Testimonials and a list of users of the equipment that this company manufactures are included on the last two pages.

BUCKET ELEVATORS—Jeffrey Mfg. Co., Columbus, O., has issued a 72-page catalog of its bucket elevators. The booklet contains illustrations and drawings of the elevators both assembled and in detail. It also contains many photographs of typical installations and several of the different types are illustrated with phantom views of the machines. The advantages are listed, as also are tables giving sizes, capacities, weights and prices. The latter portion of the catalog is devoted to the casings, motor platforms, ladders, gear guards, buckets, etc. which this company makes. These are accompanied by tables giving the information required concerning these various accessories.